CURRICULUM - 2023

C -23

DIPLOMA IN CIVIL ENGINEERING

STATE BOARD OF TECHNICAL EDUCATION & TRAINING

ANDHRA PRADESH

DIPLOMA IN CIVIL ENGINEERING
CURRICULUM- 2023 (C-23)

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PREAMBLE

Technical Education is a key driver of economic development and plays a crucial role in providing individuals with the skills and knowledge necessary to thrive in the workplace. As technological advancements continue to reshape industries and create new opportunities, it is critical that technical education curricula remain relevant and up-to-date.

The curriculum has been designed with this in mind, with a focus on practical skills, critical thinking, and problem-solving. We believe that these skills are essential for success in both academic and professional spheres. The revamping of the technical education curriculum is made with collaborative effort from educators, industry experts, policymakers, and students.

At the heart of the curriculum, is the belief that the technical education should be **student-centered**, empowering learners to take ownership of their learning and pursue their passions. We aim to create a learning environment that is safe, supportive, and nurturing, where every student has the opportunity to reach their fullest potential. We acknowledge that learning is a lifelong journey, and our curriculum is designed to provide a solid foundation for continued growth and development. We hope that our students will not only leave with a diploma but with employability and passion for learning.

The State Board of Technical Education and Training, (SBTET) AP, has been offering Diploma programmes to meet the above said aspirations of the stake holders: industries, students, academia, parents and the society at large. **The Curriculum should be flexible, adaptable, and responsive to the changing needs of the industry and society.** As such, it has been the practice of SBTET, A.P., to keep the curriculum abreast with the advances in technology through systematic and scientific analysis of current curriculum and bring out an updated revised version at regular intervals.

The design of Curriculum C-23 was started in the month of January - 2023. Feedback was collected from all stake holders: Students, Lecturers, Senior Lecturers, Head of Sections and Principals for all programmes for this purpose. Accordingly, a workshop was convened on 15th February 2023 by Smt. C. Naga Rani, I.A.S, Director of Technical Education & Chairperson, SBTET, AP to discuss on revamping of C-20 curriculum to meet the needs of industries and for improvement of placements.

The meeting was attended by Sri. Saurab Gaur, I.A.S, Principal Secretary, Skill Development & Training, Smt. Lavanya Veni, I.A.S, Director, Employment & Training. Thirteen Representatives from Industries and Fourteen Academicians from Higher Level Institutions and officials of ITI, Skill Development, CTE & SBTET attended the workshop.

Smt. C Naga Rani, I.A.S., Commissioner of Technical Education while addressing in the workshop, emphasized the necessity of industrial training and on-hand experience, that the students need to undergo to support the industries and the Gaps in the Curriculum need to be fixed to make the students passionate to work in the industry in order to support economy of the country.

The committees of each branch consisting of experts from Industries, Higher Level Institutions and Faculty of Polytechnics are informed to study the possibility of incorporating the following aspects while preparation of the curriculum so as to improve employability.

- **To bring out industry oriented Diploma Engineers.**
- **Internet of Things (IoT) for all branches**
- **Theoretical & Practical subjects 50: 50 Ratio**
- **Industry 4.0 concepts.**
- **5G Technology.**
- **Critical Thinking (Quantitative Aptitude, Data Interpretation, Quantitative reasoning etc.,) to face the written tests conducted by the industries during placements.**

In continuation, series of workshops with subject experts followed in the subsequent weeks for thorough perusal for preparation of draft curriculum. Also, the suggestions received from representatives from various industries, academic experts from higher level institutions, subject experts from Polytechnics, have been recorded, validated for incorporation into the **Curriculum C-23.** Finally, the draft curriculum was sent to academicians of higher-level institutions, industrial experts for Vetting.

The design of new Curricula C-23 for different diploma programmes has thus been finalised with the active participation of the members of the faculty teaching in the Polytechnics of Andhra Pradesh, and duly reviewed by Expert Committee constituted of academicians and representatives from industries. Thus, the primary objective of the curriculum change is to produce employable diploma holders in the country by correlating the growing needs of the industries with relevant academic input.

The outcome-based approach as given by NBA guidelines has been followed throughout the design of this curriculum and designed to meet the requirements of NBA Accreditation, too.

The Revised Curriculum i.e., Curriculum–2023 (C-23) is approved by 45th Academic Committee of SBTET, A.P for its implementation with effect from Academic Year 2023-24. Also, the SBTET, A.P under the aegis of the Department of Technical Education, Andhra Pradesh in it's 62nd Board Meeting held on 13-07-2023 (vide item no: 17) Approved to update the Polytechnic Curriculum C-23 with effect from the academic year 2023-2024 onwards after revamping the present C-20 curriculum, to meet the latest industrial technological developments including Industry 4.0 concepts.

2. HIGHLIGHTS OF CURRICULUM C-23

The following Courses/ Topics are incorporated in this curriculum C-23 as per the suggestions received from Industrial Experts, Faculty of Higher Level Institutions and Polytechnics to improve the Employability Skills of the Polytechnic Students.

i) To bring the balance between theory and practicals, Construction practice is moved to IV semester and CAD Practice-I is placed in III Semester, so that 5 theory and 5 Lab Courses (50:50) are maintained in III Semester.
ii) New theory course named "Construction Technology and Valuation" (C-401) is incorporated in IV Semester & CAD Practice-II (C-410) is moved to IV Semester, so that 5 theory and 5 Lab Courses (50:50) are maintained in IV Semester.
iii) Quantity surveying-I & II are merged as single subject "Quantity Surveying" (C-503) and placed in V semester by deleting repetitive / inappropriate / topics coved in proposed new subject.
iv) New theory course named "Advanced Civil Engineering Technologies" (C-504) is introduced in V semester which covers IOT application in CIVIL Engineering, Prestressed concrete, Prefabricated structures, Advanced Retaining walls, Green Building Technology, Solar energy utilization in buildings.
v) New Lab Course named "Computer Applications in Civil Engineering" (C-509) is introduced in V Semester which covers MS Excel applications in building estimation, RCC detailing using AUTOCAD, RCC Structural analysis using STAADPRO, ETABS etc, Construction project management using GANTT / MS Project.
vi) Project work (C-510) is introduced in V Semester so that the students will get an opportunity to do their work with live projects.
vii) Students Centric Learning activities like Sports / Games / Library / Learning activities related to placements (3 periods duration in each semester including I Year)
viii) The Proposed C23 Curriculum covers the following aspects

- Latest advancement in Civil Engineering
- Industry requirement
- Alternate materials and technology
- Soft skill up gradation for better showcasing of abilities
- Employability

3. ACKNOWLEDGEMENTS

The Members of the working group are grateful to Smt C. Naga Rani I.A.S., Commissioner of Technical Education & Chairman of SBTET, for continuous guidance and valuable inputs during process of revising, modifying and updating the Curriculum C-20 to Curriculum C-23.

We are grateful to Sri. S. Suresh Kumar, I.A.S, Principal Secretary, Skills Development & Training for his valuable suggestions to bring the revamped curriculum C-23 in to a final form to meet latest Industry 4.0 concepts.

We are grateful to Sri. Saurab Gaur, I.A.S, former Principal Secretary, Skills Development & Training who actively participated in the Industry-Academia workshop conducted on 15th February, 2023 and offered valuable suggestions and insights into the learning needs and preferences so that the curriculum is engaging, inclusive, and effective.

It is pertinent to acknowledge the support of the following in the making of Curriculum C-23. A series of workshops in different phases were conducted by SBTET, AP, Guntur involving faculty from Polytechnics, Premier Engineering Colleges & representatives from various Industries and Dr. C. R. Nagendra Rao, Professor & Head, NITTTR-ECV to analyse the Previous C-20 Curriculum and in designing of C-23 Curriculum, is highly appreciated and gratefully acknowledged.

We also extend our sincere thanks to Sri. V. Padma Rao, Joint Director of Technical Education, Sri K.V. Ramana Babu, Secretary, SBTE&T, Andhra Pradesh, Sri K. Vijaya Bhaskar, Deputy Director (Academic) , Andhra Pradesh, officials of Directorate of Technical Education and the State Board of Technical Education, Andhra Pradesh and all teaching fraternity from the Polytechnics who are directly or indirectly involved in preparation of the curricula.

4. RULES AND REGULATIONS OF C-23 CURRICULUM

4.1 Duration and pattern of the courses

All the Diploma programs run at various institutions are of AICTE approved 3 years or 3½ years duration of academic instruction. All the Diploma courses are run on year wise pattern in the first year, and the remaining two or two & half years are run in the semester pattern. In respect of few courses like Diploma in Bio-Medical course, the training will be in the seventh semester. **Run-through system is adopted for all the Diploma Courses, subject to eligibility conditions.**

4.2 Procedure for Admission into the Diploma Courses:

Selection of candidates is governed by the Rules and Regulations laid down in this regard from time to time.

a) Candidates who wish to seek admission in any of the Diploma courses will have to appear for the Common Entrance Test for admissions into Polytechnics (POLYCET) conducted by the State Board of Technical Education and Training, Andhra Pradesh, Vijayawada. Only the candidates satisfying the following requirements will be eligible to appear for the Common Entrance Test for admissions into Polytechnics (POLYCET).
    a. The candidates seeking admission should have appeared for S.S.C examination, conducted by the Board of Secondary Education, Andhra Pradesh or equivalent examination thereto, at the time of applying for the Common Entrance Test for admissions into Polytechnics (POLYCET). In case of candidates whose results of their Qualifying Examinations is pending, their selection shall be subject to production of proof of their passing the qualifying examination in one attempt or compartmentally at the time of admission.
    b. Admissions are made based on the merit obtained in the Common Entrance Test (POLYCET) and the reservation rules stipulated by the Government of Andhra Pradesh from time to time.
    c. For admission into the following Diploma Courses for which entry qualification is 10+2, candidates need not appear for POLYCET. A separate notification will be issued for admission into these courses.
        i). D.HMCT ii).D. Pharmacy

4.3 Medium of Instruction

The medium of instruction and examination shall be English.

4.4 Permanent Identification Number (PIN)

A cumulative / academic record is to be maintained of the Marks secured in sessional work and end examination of each year for determining the eligibility for promotion etc., A Permanent Identification Number (PIN) will be allotted to each admitted candidate to maintain academic records.

4.5 Number of Working Days Per Semester / Year:

a) The Academic year for all the Courses shall be in accordance with the Academic Calendar.

b) The Working days in a week shall be from Monday to Saturday
c) There shall be 7 periods of 50 minutes duration each on all working days.
d) The minimum number of working days for each semester / year shall be 90 / 180 days excluding examination days. If this prescribed minimum is not achieved due to any reason, special arrangements shall be made to conduct classes to complete the syllabus.

4.6 Eligibility (Attendance to Appear for the End Examination)

a) A candidate shall be permitted to appear for the end examination in all subjects, if he or she has attended a minimum of 75% of working days during the year/Semester.
b) Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester or 1st year may be granted on medical grounds.
c) A stipulated fee shall be payable towards condonation for shortage of attendance.
d) Candidates having less than 65% attendance shall be detained.
e) Students whose shortage of attendance is not condoned in any semester / 1st year and not paid the condonation fee in time are not eligible to take their end examination of that class and their admissions shall stand cancelled. They may seek re-admission for that semester / 1st year when offered in the next subsequent academic semester/year.

For INDUSTRIAL TRAINING:
i) During Industrial Training the candidate shall put in a minimum of 90% attendance.
ii) If the student fails to secure 90% attendance during industrial training, the student shall reappear for 6 months industrial training at his own expenses.

4.7 Readmission

Readmission shall be granted to eligible candidates by the respective Principal/ Regional Joint Director.

a) (i) Within 15 days after commencement of class work in any semester (Except Industrial Training).
   (ii) For Industrial Training: before commencement of the Industrial training.
b) Within 30 days after commencement of class work in any year (including D. Pharmacy course or first year course in Engineering and Non-Engineering Diploma streams). Otherwise, such cases shall not be considered for readmission for that semester / year and are advised to seek readmission in the next subsequent eligible academic year.
c) The percentage of attendance of the readmitted candidates shall be calculated from the first day of beginning of the regular class work for that year / Semester, as officially announced by CTE/SBTET but not from the day on which he/she has actually reported to the class work.

4.8 Scheme of Evaluation

a) First Year

Theory Courses: Each Course carries Maximum marks of 80 with an end examination of 3 hours duration, along with internal assessment for Maximum of 20 marks. (Sessional marks). However, there are no minimum marks prescribed for sessionals.

Laboratory Courses: There shall be 40/20 Marks for internal assessment i.e. sessional marks for each practical Course with an end examination of 3 hours duration carrying 60/30 marks. However, there are no minimum marks prescribed for sessional.

b) III, IV, V, VI and VII Semesters:

Theory Courses: End semester evaluation shall be of 3 hours duration and for a maximum of 80 marks.

Laboratory Courses: Each Course carry 60/30 marks of 3 hours duration 40/20 sessional marks.

4.9 Internal Assessment Scheme

a) Theory Courses: Internal assessment shall be conducted for awarding Sessional marks on the dates specified. **Three-unit tests shall be conducted for I year students and two Unit Tests for semesters. The details are presented below.**

S. No.	Type of Assessment	Weightage Assigned
(i)	Testing of knowledge through mid-examination for year/sem as (Mid-1+Mid-2+Mid3) or (Mid-1 + Mid-2)	40
(ii)	Assignments	5
(iii)	*Dynamic Learning activities : Project Work/ Seminar/Tech-fest/Group Discussion, Quizzes etc./Extra-curricular activities/NSS/NCC/ IPSGM/Cleaning & Greening of Campus etc.*	*5*
	T O T A L	50

Internal Assessment shall be of 90 minutes duration and for a maximum of 40 marks for each test.

At least one assignment should be completed for each unit which carries 10 marks. The total assignment marks should be reduced to 5.

The dynamic learning activity is to be conducted which carries 10 marks. The total marks should be reduced to 5.

The total 50 marks assigned to internal assignment is to be scaled down to 20 marks.

b) Practical Courses:

(i) **Drawing Courses:**

The award of Sessional marks for internal Assessment shall be as given in the following table:

Distribution of Marks for the Internal Assessment Marks			
First Year (Total:40 Marks)		**Semesters (Total:40 Marks)**	
Max:20 Marks	Max:20 Marks	Max:20 Marks	Max:20 Marks
From the Average of THREE Unit Tests.	From the Average of Assessment of Regular Class work Exercises.	From the Average of TWO Unit Tests.	From the Average of Assessment of Regular Class work Exercises.

- For first year engineering drawing each unit test will be conducted for a duration of 2 hours with maximum marks of 40.
- (Part - A: 4 questions x 5 marks = 20 Marks; Part –B: 2 questions x 10 marks = 20 marks).
- For the semester drawing examinations, Two Unit tests shall be conducted as per the Board End Examination Question Paper Pattern.
- All Drawing exercises are to be filed in serial order and secured for further scrutiny by a competent authority

(ii) Laboratory Courses:

(a) Student's performance in Laboratories / Workshop shall be assessed during the year/ semester of study for 40 marks in each practical Course.

(b) Evaluation for Laboratory Courses, other than Drawing courses:

i. Instruction (teaching) in laboratory courses (except for the course on Drawing) here after shall be task/competency based as delineated in the Laboratory sheets, prepared by SBTET, AP & NITTTR- ECV and posted in SBTET website.
ii. Internal assessment for Laboratory shall be done on the basis of task/s performed by the student as delineated in the laboratory sheets, prepared by SBTET, AP & NITTTR- ECV and posted in AP, SBTET website.
iii. Question paper for End semester Evaluation shall also be task/s based and shall be prepared and distributed by SBTET as done in case of theory courses be prepared as per SBTET rules in vogue.

c) Internal assessment in Labs / workshops / Survey field work etc., during the course of study shall be done and sessional marks shall be awarded by the concerned Teacher.

d) For practical examinations, except in drawing, there shall be two examiners. External examiner shall be appointed by the Principal in consultation with respective Head of Section preferably choosing a qualified person from in the order of preference.

i) Nearby Industry

ii) Govt / Semi Govt organization like R & B, PWD, PR, Railways, BSNL, APSRTC, APSEB etc.
iii) Govt / University Engg College.
iv) HoD/Senior Lecture (Selection Grade-II) from the Govt. Polytechnic
Internal examiner shall be the person concerned with internal assessment as in (c) above. The end examination shall be held along with all theory papers in respect of drawing.

e) Question Paper for Practicals: Question paper should cover (the experiments / exercise prescribed to test various) skills like handling, manipulating, testing, trouble shooting, repair, assembling and dismantling etc., from more than one experiment / exercise

f) Records pertaining to internal assessment marks of both theory and practical Courses are to be maintained for official inspection.

g) In case of Diploma programs having Industrial Training, Internal Assessment and Summative Evaluation, shall be done as illustrated in the following table:

Assessment no	**Upon completion of**	**By**	**Based on**	**Max Marks**
1	12 weeks	1.The faculty concerned (Guide) and 2. Training in charge (Mentor) of the industry	Learning outcomes as given in the scheme of assessment ,for Industrial Training	120
2	22 weeks			120
3. Final summative Evaluation	24 week	1.The faculty member concerned, 2.HoD concerned and 3.An external examiner	1.Demonstration of any one of the skills listed in learning outcomes	30
			2.Training Report	20
			3.Viva Voce	10
			TOTAL	**300**

h) Each staff member including Head of Section shall be assigned a batch of students 10 to 15 for making assessment during industrial training.

4.10 Minimum Pass Marks

a) Theory Examination:

For passing a theory Course, a candidate has to secure a minimum of 35% in end examination and a combined minimum of 35% of both Sessional and end examination marks put together.

b) Practical Examination:

For passing a practical Course, a candidate has to secure a minimum of 50% in end examination and a combined minimum of 50% of both sessional and practical end examination marks put together. In case of D.C.C.P., the pass mark for typewriting and short hand is 45% in the end examination. There are no sessional marks for typewriting and Shorthand Courses of D.C.C.P course.

C) Industrial Training:

I. Monitoring: Similar to project work each teacher may be assigned a batch of 10-15 students irrespective of the placement of the students to facilitate effective monitoring of students learning during industrial training.

II. Assessment: The Industrial training shall carry 300 marks and pass marks is 50% in assessments at industry (first and second assessment) and final summative assessment at institution level put together i.e. 150 marks out of 300 marks. And also student has to secure 50% marks in final summative assessment at institution level.

III. In-Plant Industrial Training for 3-Year Diploma (C-23) Courses is scheduled as per the Academic Calendar of the SBTET every year.

4.11. Provision for Improvement

Improvement is allowed only after he / she has completed all the Courses from First Year to Final semester of the Diploma.

a) Improvement is allowed in any 4 (Four) Courses of the Diploma.
b) The student can avail of this improvement chance **ONLY ONCE**, that too within the succeeding two examinations after the completion of Diploma. However, the duration including Improvement examination shall not exceed **FIVE** years from the year of first admission.
c) No improvement is allowed in Practical / Lab Courses or Project work or Industrial Training assessment. However, improvement in drawing Course(s) is allowed.
d) If improvement is not achieved, the marks obtained in previous Examinations hold good.
e) Improvement is not allowed in respect of the candidates who are punished under Mal-practice in any Examination.
f) Examination fee for improvement shall be paid as per the notification issued by State Board of Technical Education and Training from time to time.
g) All the candidates who wish to appear for improvement of performance shall deposit the original Marks Memos of all the years / Semesters and also original Diploma Certificate to the Board. If there is improvement in performance of the current examination, the revised Memorandum of marks and Original Diploma Certificate will be issued, else the submitted originals will be returned.

4.12. Rules of Promotion From 1ST YEAR TO 3rd, 4th, 5th, 6th and 7th Semesters:

A) For Diploma Courses of 3 Years duration

i). A candidate shall be permitted to appear for first year examination provided he / she puts in 75% attendance (which can be condoned on Medical grounds up to 10%) and pay the examination fee.

ii) A candidate shall be promoted to 3rd semester if he/she puts the required percentage of attendance in the first year and pays the examination fee. A candidate who could not pay the first year examination fee has to pay the promotion fee as prescribed by State Board of Technical Education and Training, AP from time to time before commencement of 3rd semester.

A candidate is eligible to appear for the 3rd semester examination if he/she puts the required percentage of attendance in the 3rd semester and pays the examination fee.

iii) A candidate shall be promoted to 4th semester provided he/she puts the required percentage of attendance in the 3rd semester and pay the examination fee. A candidate, who could not pay the 3rd semester exam fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training AP from time to time before commencement of 4th semester. A candidate is eligible to appear for the 4th semester examination if he/she puts the required percentage of attendance in the 4th semester and pays the examination fee.

iv) A candidate shall be promoted to 5th semester provided he / she puts the required percentage of attendance in the 4th semester and pays the examination fee. A candidate, who could not pay the 4th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 5th semester.

A candidate is eligible to appear for the 5th semester examination if he/she puts the required percentage of attendance in the 5th semester and pays the examination fee.

v) A candidate shall be sent to Industrial training / VI semester provided he/she puts in the required percentage of attendance in the 5th semester and pay the examination fee/ promotion fee as prescribed by SBTET.
A candidate is eligible to appear for Industrial Training assessment (Seminar/Viva-voce) puts the required percentage of attendance, i.e., 90% in 6th semester Industrial Training.

For IVC & ITI Lateral Entry students:

i.) A candidate shall be permitted to appear for Third Semester examination provided he / she puts in 75% attendance (which can be condoned on Medical grounds up to 10%) and pay the examination fee for Third semester.

ii) A candidate shall be promoted to 4th semester provided he/she puts the required percentage of attendance in the 3rd semester and pay the examination fee. A candidate, who could not pay the 3rd semester exam fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training AP from time to time before commencement of 4th semester.

A candidate is eligible to appear for the 4th semester examination if he/she puts the required percentage of attendance in the 4th semester and pays the examination fee.

ii) A candidate shall be promoted to 5th semester provided he / she puts the required percentage of attendance in the 4th semester and pays the examination fee. A candidate, who could not pay the 4th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 5th semester.

A candidate is eligible to appear for the 5th semester examination if he/she puts the required percentage of attendance in the 5th semester and pays the examination fee.

iii) A candidate shall be sent to Industrial training / VI semester provided he/she puts in the required percentage of attendance in the 5th semester and pay the examination fee/ promotion fee as prescribed by SBTET.
A candidate is eligible to appear for Industrial Training assessment (Seminar/Viva-voce) puts the required percentage of attendance, i.e., 90% in 6th semester Industrial Training and pays the examination fee.

B) For Diploma Courses of 3 ½ Years duration (MET/ CH/ CHPP/ CHPC/ CHOT/ TT):

i. A candidate shall be permitted to appear for 1st year examination provided he / she puts in 75% attendance (which can be condoned on Medical grounds up to 10%) i.e. attendance after condonation on Medical grounds should not be less than 65% and pay the examination fee.
ii. A candidate shall be promoted to 3rd semester if he/she puts the required percentage of attendance in the 1st year and pays the examination fee. A candidate who could not pay the 1st year examination fee has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 3rd semester.
iii. A candidate shall be promoted to 4th semester provided he/she puts the required percentage of attendance in the 3rd semester and pay the examination fee. A candidate, who could not pay the 3rd semester exam fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 4th semester.
A candidate is eligible to appear for the 4th semester exam if he/she puts the required percentage of attendance in the 4th semester

<u>For IVC & ITI Lateral Entry students</u>:

a) Puts the required percentage of attendance in the 4th semester

iv. A candidate shall be promoted to 5th semester industrial training provided he / she puts the required percentage of attendance in the 4th semester and pays the examination fee. A candidate, who could not pay the 4th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 5th semester.
v. Promotion from 5th to 6th semester is automatic (i.e., from 1st spell of Industrial Training to 2nd spell) provided he/she puts the required percentage of

attendance, which in this case ie.,90 % of attendance and attends for the VIVA-VOCE examination at the end of training.

vi. A candidate shall be promoted to 7th semester provided he / she puts the required percentage of attendance in the 6th semester and pays the examination fee. A candidate, who could not pay the 6th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 7th semester.

vii. A candidate shall be promoted to 7th semester of the course provided he/she has successfully completed both the spells of Industrial Training.

A candidate is eligible to appear for 7th semester examination if he/she

a) Puts in the required percentage of attendance in the 7th semester

For IVC & ITI Lateral Entry students:

a) Puts in the required percentage of attendance in the 7 th semester.

C) For Diploma Courses of 3 ½ Years duration (BM):

The same rules which are applicable for conventional courses also apply for this course. The industrial training in respect of this course is restricted to one semester (6 months) after the 6th semester (3 years) of the course.

i. A candidate shall be permitted to appear for first year examination provided he / she puts in 75% attendance (which can be condoned on Medical grounds up to 10%) i.e. attendance after condonation on Medical grounds should not be less than 65% and pay the examination fee.

ii. A candidate shall be promoted to 3rd semester if he/she puts the required percentage of attendance in the first year and pays the examination fee. A candidate who could not pay the first year examination fee has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 3rd semester.

iii. A candidate shall be promoted to 4th semester provided he/she puts the required percentage of attendance in the 3rd semester and pay the examination fee. A candidate who could not pay the 3rd semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 4th semester.

A candidate is eligible to appear for the 4th semester examination if he/she

a) Puts in the required percentage of attendance in the 4th semester

For IVC & ITI Lateral Entry Students:

A candidate is eligible to appear for the 4th semester examination if he/she puts the required percentage of attendance in the 4th semester

iv. A candidate shall be promoted to 5th semester provided he / she puts the required percentage of attendance in the 4th semester and pays the examination fee. A candidate, who could not pay the 4th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 5th semester.

A candidate is eligible to appear for the 5th semester exam if he/she

a) Puts in the required percentage of attendance in the 5th semester.

For IVC & ITI Lateral Entry students:

a) Puts in the required percentage of attendance in the 5th semester.

v. A candidate shall be promoted to 6th semester provided he/she puts in the required percentage of attendance in the 5th semester and pays the examination fee.

A candidate who could not pay the 5th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 6th semester.

A candidate is eligible to appear for 6th semester examination

a) Puts in the required percentage of attendance in 6th semester

IVC & ITI Lateral Entry students:

a) Puts in the required percentage of attendance in 6th semester.

vi. A candidate shall be promoted to 7th semester provided he/she puts in the required percentage of attendance in 6th semester and pay the examination fee. A candidate, who could not pay the 6th semester examination fee, has to pay the promotion fee prescribed by SBTET from time to time before commencement of the 7th semester (Industrial Training).

A candidate is eligible to appear for 7th semester Industrial Training assessment (Seminar/Viva-voce) if he/she

a) Puts in the required percentage of attendance, i.e., 90% in 7th semester Industrial Training.

For IVC & ITI Lateral Entry students:

a) Puts in the required percentage of attendance, i.e., 90% in 7th semester Industrial Training.

4.13. Students Performance Evaluation

Successful candidates shall be awarded the Diploma under the following divisions of pass.

a) First Class with Distinction shall be awarded to the candidates who secure an overall aggregate of 75% marks and above.
b) First Class shall be awarded to candidates who secure overall aggregate of 60% marks and above and below 75% marks.
c) Second Class shall be awarded to candidates who secure a pass with an overall aggregate of below 60%.
   i. The Weightage of marks for various year/Semesters which are taken for computing overall aggregate shall be 25% of I year marks + 100% of 3rd and subsequent Semesters.
   ii. In respect IVC & ITI Lateral Entry candidates who are admitted directly into diploma course at the 3rd semester (i.e., second year) level the aggregate of (100%) marks secured at the 3rd and subsequent semesters of study shall be

taken into consideration for determining the overall percentage of marks secured by the candidates for award of class/division.

d) Second Class shall be awarded to all students, who fail to complete the Diploma in the regular 3 years/ 3 ½ years and four subsequent examinations from the year of first admission.

4.14. EXAMINATION FEE SCHEDULE:

The examination fee should be as per the notification issued by State Board of Technical Education and Training, AP from time to time.

4.15. Structure of Examination Question Paper:

I. Formative assessment (Internal examination)

a) For theory Courses:

Three-unit tests for first year and two-unit tests for semesters shall be conducted with a duration of 90 minutes for each test for maximum marks of 40. It consists of part A and Part B.

Part A contains five questions and carries 16 marks. Among these five questions first question consists of four objective items like one word or phrase answer/filling-in the blanks/true or false etc with one mark for each question. The other four questions are short answer questions and carry three marks each.

Part B carries 24 marks and consists of three questions with internal choice ie., Either/Or type , and each question carries 8 marks.

The sum of marks of 3 tests for I year and 2 tests for semesters including assignments and Dynamic learning activities (50 marks) shall be reduced to 20 marks in each Course for arriving at final sessional marks.

b) For drawing Courses:

For I year:

Three-unit tests with duration of 90 minutes and for maximum marks of 40 marks shall be conducted for first year. It consists of part A and Part B.

Part A consists four questions for maximum marks of 16 and each question carries four marks (4×4 marks=16 marks).

Part B carries maximum marks of 24 and consists of five questions while the student shall answer any three questions out of these five questions. Each question in this part carries a maximum mark of 8, (3×8 marks=24 marks).

The sum of marks obtained in 3-unit test marks shall be reduced to 20 marks for arriving at final sessional marks. Remaining 20 marks are awarded by the Course teacher based on the student's performance during regular class exercise.

For semester: Two-unit tests with duration of 90 minutes and for maximum marks of 40 marks shall be conducted. The sum of marks obtained in 2-unit test marks shall be reduced to 20 marks for arriving at final sessional marks. Remaining 20

marks are awarded by the Course teacher based on the student's performance during regular class exercise.

c) For Laboratory /workshop: 50% of total marks for the Course shall be awarded based on continuous assessment of the student in laboratory/workshop classes and the remaining 50% shall be based on the sum of the marks obtained by the students in two tests.

II. Summative assessment (End examination)

The question paper for theory examination is patterned in such a manner that the Weightage of periods/marks allotted for each of the topics for a particular Course be considered. End Examination paper is of 3 hours duration.

a) **Each theory paper consists of Section 'A' and 'B'**
Section 'A' with Max marks of 30, contains 10 short answer questions. All questions are to be answered and each carry 3 marks, i.e., 10 x 3 = 30.

Section 'B' with Max marks of 50 contains 8 essay type questions. Only 5 questions are to be answered and each carry 10 marks, i.e., Max. Marks: 5 x 10 = 50.

Thus, the total marks for theory examination shall be: 80.

b) **For Engineering Drawing Course (107) consist of section 'A' and section 'B'**.

Section 'A' with max marks of 20, contains four (4) questions. All questions in section 'A' are to be answered to the scale and each carries 5 marks, ie. 4 x 5=20.

Section 'B' with max marks of 40, contains six (6) questions. The student shall answer any four (4) questions out of the above six questions and each question carries 10 Marks, i.e., 4 x 10 = 40.

c) **Practical Examinations**
For Workshop practice and Laboratory Examinations, Each student has to pick up a question paper distributed by Lottery System.

Max. Marks for an experiment / exercise	:	50
Max. Marks for VIVA-VOCE	:	10
Total Max. Marks	:	60

In case of practical examinations with 50 marks, the marks shall be distributed as

Max. Marks for an experiment / exercise	:	25
Max. Marks for VIVA-VOCE	:	05
Total Max. Marks	:	30

In case of any change in the pattern of question paper, the same shall be informed sufficiently in advance to the candidates.

d) **Note: Evaluation for Laboratory Courses, other than Drawing courses**:

I. Instruction (teaching) in laboratory courses (except for the course on Drawing) hereafter shall be task/competency based as delineated in the Laboratory sheets, prepared by SBTET, AP and posted in its website.

II. Internal assessment for Laboratory shall be done on basis of task/s performed by the student as delineated in the laboratory sheets, prepared by SBTET, AP and posted in its website.

III. Question paper for End semester Evaluation shall be prepared as per SBTET rules in vogue.

4.16. ISSUE OF MEMORONDUM OF MARKS

All candidates who appear for the end examination will be issued memorandum of marks without any payment of fee. However candidates who lose the original memorandum of marks have to pay the prescribed fee to the Secretary, State Board of Technical Education and Training, A.P. for each duplicate memo from time to time.

4.17. MAXIMUM PERIOD FOR COMPLETION OF DIPLOMA PROGRAMMES:

Maximum period for completion of the diploma courses is twice the duration of the course from the date of First admission (includes the period of detention and discontinuation of studies by student etc) failing which they will have to forfeit the claim for qualifying for the award of Diploma (They will not be permitted to appear for examinations after that date). This rule applies for all Diploma courses of 3 years and 3 ½ years of engineering and non-engineering courses.

4.18. ELIGIBILITY FOR AWARD OF DIPLOMA

A candidate is eligible for award of Diploma Certificate if he / she fulfil the following academic regulations.

i. He / She pursued a course of study for not less than 3 / 3 ½ academic years & not more than 6 / 7 academic years.

ii. He / she have completed all the Courses.
Students who fail to fulfil all the academic requirements for the award of the Diploma within 6 / 7 academic years from the year of admission shall forfeit their seat in the course & their seat shall stand cancelled.

For IVC & ITI Lateral Entry students:

i. He / She pursued a course of study for not less than 2 / 2 ½ academic years & not more than 4 / 5 academic years.

ii. He / she has completed all the Courses.
Students who fail to fulfil all the academic requirements for the award of the Diploma within 4 / 5 academic years from the year of admission shall forfeit their seat in the course & their seat shall stand cancelled.

4.19. ISSUE OF PHOTO COPY OF VALUED ANSWER SCRIPT, RECOUNTING& REVERIFICATION:

A) FOR ISSUE OF PHOTO COPIES OF VALUED ANSWER SCRIPTS

I. A candidate desirous of applying for Photo copy of valued answer script/s should apply within prescribed date from the date of the declaration of the result.

II. Photo copies of valued answer scripts will be issued to all theory Courses and Drawing Course (s).

III. The Photo copy of valued answer script will be dispatched to the concerned candidate's address as mentioned in the application form by post.

IV. No application can be entertained from third parties.

B) FOR RE-COUNTING (RC) and RE-VERIFICATION(RV) OF THE VALUED ANSWER SCRIPT

i. A candidate desirous of applying for Re-verification of valued answer script should apply within prescribed date from the date of the declaration of the result.

ii. Re-verification of valued answer script shall be done for all theory Courses' and Drawing Course(s).

iii. The Re-verification committee constituted by the Secretary, SBTETAP with Course experts shall re-verify the answer scripts.

I. **RE-COUNTING**

The Officer of SBTET will verify the marks posted and recount them in the already valued answer script. The variations if any will be recorded separately, without making any changes on the already valued answer script. The marks awarded in the original answer script are maintained (hidden).

II. RE-VERIFICATION

(i) The Committee has to verify the intactness and genuineness of the answer script(s) placed for Re-verification.

(ii) Initially single member shall carry out the re-verification.

(iii) On re-verification by single member, if the variation is less than 12% of maximum marks, and if there is no change in the STATUS in the result of the candidate, such cases will not be referred to the next level ie., for 2-Tier evaluation.

(iv) On re-verification by a single member, if the variation is more than 12% of maximum marks, it will be referred to 2-Tier evaluation.

(v) If the 2-Tier evaluation confirms variation in marks as more than 12% of maximum marks, the variation is considered as follows:

a) If the candidate has already passed and obtains more than 12% of the maximum marks on Re-verification, then the variation is considered.

b) If the candidate is failed and obtains more than 12% of the maximum marks on Re-verification and secured pass marks on re-verification, then the status of the candidate changes to PASS.

c) If a candidate is failed and obtains more than 12% of the maximum marks on Re-verification and if the marks secured on re-verification are still less than the minimum pass marks, the status of the candidate remain FAIL only.

(vii) After Re-verification of valued answer script the same or change if any therein on Re-verification, will be communicated to the candidate.

(viii) On Re-verification of Valued Answer Script if the candidate's marks are revised, the fee paid by the candidate will be refunded or else the candidate has to forfeit the fee amount.

Note: No request for Photo copies/ Recounting /Re-verification of valued answer script would be entertained from a candidate who is reported to have resorted to Malpractice in that examination.

4.20. Mal Practice Cases:

If any candidate resorts to Mal Practice during examinations, he / she shall be booked and the Punishment shall be awarded as per SBTETAP rules and regulations in vogue.

4.21. Discrepancies/ Pleas:

Any Discrepancy /Pleas regarding results etc., shall be represented to the SBTETAP within one month from the date of issue of results. Thereafter, no such cases shall be entertained in any manner.

4.22. Issue of Duplicate Diploma

If a candidate loses his/her original Diploma Certificate and desires a duplicate to be issued he/she should produce written evidence to this effect. He / she may obtain a duplicate from the Secretary, State Board of Technical Education and Training, A.P., on payment of prescribed fee and on production of an affidavit signed before a First-Class Magistrate (Judicial) and non-traceable certificate from the Department of Police. In case of damage of original Diploma Certificate, he / she may obtain a duplicate certificate by surrendering the original damaged certificate on payment of prescribed fee to the State Board of Technical Education and Training, A.P.

In case the candidate cannot collect the original Diploma within 1 year from the date of issue of the certificate, the candidate has to pay the penalty prescribed by the SBTET AP from time to time.

4.23. Issue of Migration Certificate and Transcripts:

The Board on payment of prescribed fee will issue these certificates for the candidates who intend to prosecute Higher Studies in India or Abroad.

4.24. General

i. The Board may change or amend the academic rules and regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students, for whom it is intended, with effect from the dates notified by the competent authority.

ii. All legal matters pertaining to the State Board of Technical Education and Training, AP are within the jurisdiction of Mangalagiri.
iii. In case of any ambiguity in the interpretation of the above rules, the decision of the Secretary, SBTET, A.P is final.

VISION
Develop Civil Engineering professionals competent to face the global challenges in a progressive environment conducive to learn technical knowledge, skills blended with ethics and values, to serve the society and to better it for a happy and comfortable living.

MISSION

M1	To provide a competitive learning environment, through a need based curriculum designed in collaboration with industry, conducive for high quality education emphasising on transfer of knowledge and skill development essential for the profession and the society as well.
M2	To nurture higher order leadership qualities and ethics and values in students to enable them to be leaders in their chosen professions while maintaining the highest level of ethics.
M3	To encourage the spirit of inquisition to promote innovation and entrepreneurship strengthened with life skills to sustain the stress.
M4	To foster effective interactions and networking with all the stake holders so as to work towards the growth and sustainability of the society and environment.

PROGRAMME OUTCOMES(POs)

1. **Basic and discipline specific knowledge**: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.
2. **Problem analysis**: Identify and analyse well-defined engineering problems using codified standard methods.
3. **Design/Development of solutions**: Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs .
4. **Engineering tools, Experimentation and Testing**: Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.

5. **Engineering practices for society, sustainability and environment**: Apply appropriate technology in context of society, sustainability, environment and ethical practices.
6. **Project Management**: Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.
7. **Life-long learning**: Ability to analyse individual needs and engaging updating in the context of technological changes.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

1. An ability to apply disciplines - specific knowledge to solve core and/or applied Civil Engineering problems.
2. An ability to plan and perform experiments and practices and to use the results to solve Civil Engineering problems.
3. Apply appropriate technologies and tools with an understanding of the limitations.

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTION AND MODEL BLUE PRINT FOR EVALUATION
CURRICULUM-2023
FIRST YEAR

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods Per Year	Scheme of Examination			
		Theory	Practical		Duration (hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY								
C-101	English	3		90	3	20	80	100
C-102	Engineering Mathematics – I	5		150	3	20	80	100
C-103	Engineering Physics	3		90	3	20	80	100
C-104	Engineering Chemistry and Environmental studies	3		90	3	20	80	100
C-105	Engineering Mechanics	5		150	3	20	80	100
C-106	Surveying-I	4		120	3	20	80	100
PRACTICAL								
C-107	Engineering Drawing	-	6	180	3	40	60	100
C-108	Surveying - I Practice & Plotting	-	4	120	3	40	60	100
C-109	Physics Laboratory	-	3	45	1½	20	30	50
C-110	Chemistry Laboratory	-		45	1½	20	30	50
C-111	Computer Fundamentals Practice	-	3	90	3	40	60	100
	Student Centric Learning Activities		3	90				
	Total	**23**	**19**	**1260**		**280**	**720**	**1000**

[Note: C-101,102,103,104,109,110,111 are common with all branche

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTION AND MODEL BLUE PRINT FOR EVALUATION
CURRICULUM-2023

THIRD SEMESTER

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods Per Year	Scheme Of Examination			
		Theory	Practical		Duration (hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY								
C-301	Engineering Mathematics –II	4		60	3	20	80	100
C-302	Mechanics of Solids & Theory Of Structures	5		75	3	20	80	100
C-303	Hydraulics	5		75	3	20	80	100
C-304	Surveying-II	4		60	3	20	80	100
C-305	Construction Materials	3		45	3	20	80	100
PRACTICAL								
C-306	Civil Engineering Drawing-I	-	4	60	3	40	60	100
C-307	CAD Practice-I		4	60	3	40	60	100
C-308	Surveying – II Practice& Plotting	-	4	60	3	40	60	100
C-309	Material Testing Practice	-	3	45	3	40	60	100
C-310	Hydraulics Practice	-	3	45	3	40	60	100
	Student Centric Learning Activities	-	3	45				
	Total	**21**	**21**	**630**		**280**	**720**	**1000**

[Note: C-301 is Common with A/AA/CER/EE/M/MET/MNG/TT-301]

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTION AND MODEL BLUE PRINT FOR EVALUATION
CURRICULUM-2023

FOURTH SEMESTER

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods Per Year	Scheme Of Examination			
		Theory	Practical		Duration (hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY								
C-401	Construction Technology & Valuation	4		60	3	20	80	100
C-402	Design and Detailing of R.C. Structures	5		75	3	20	80	100
C-403	Construction Practice	4		60	3	20	80	100
C-404	Transportation Engineering	4		60	3	20	80	100
C-405	Irrigation Engineering	4		60	3	20	80	100
PRACTICAL								
C-406	Civil Engineering Drawing-II		6	90	3	40	60	100
C-407	Concrete & Soil Testing Practice		3	45	3	40	60	100
C-408	Communication Skills		3	45	3	40	60	100
C-409	Surveying-III Practice		3	45	3	40	60	100
C-410	CAD Practice-II		3	45	3	40	60	100
	Student Centric Learning Activities		3	45				
	Total	**21**	**21**	**630**		**300**	**700**	**1000**

[Note: C-408 is Common with all Branches]

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTION AND MODEL BLUE PRINT FOR EVALUATION
CURRICULUM-2023

FIFTH SEMESTER

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods Per Year	Scheme Of Examination			
		Theory	Practical		Duration (hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY								
C-501	Steel Structures	4		60	3	20	80	100
C-502	Environmental Engineering	5		75	3	20	80	100
C-503	Quantity Surveying	5		75	3	20	80	100
C-504	Advanced Civil Engineering Technologies	4		60	3	20	80	100
C-505	Construction Management &Entrepreneurship	3		45	3	20	80	100
PRACTICAL								
C-506	Structural Engineering Drawing		4	60	3	40	60	100
C-507	Field Practices		4	60	3	40	60	100
C-508	Life Skills		3	45	3	40	60	100
C-509	Computer Applications in Civil Engineering		4	60				
C-510	Project work		3	45	3	40	60	100
	Student centric learning		3	45				
	Total	**21**	**21**	**630**		**280**	**720**	**1000**

[Note: C-508 is Common with all Branches]

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTION AND MODEL BLUE PRINT FOR EVALUATION
CURRICULUM-2023

SIXTH SEMESTER

SI. No.	Subject	Duration	Scheme of evaluation		
			Item	**Nature**	**Max. Marks**
1	Industrial Training	6 months	1.First Assessment at Industry (After 12 Weeks)	Assessment of Learning outcomes by both the faculty and training Mentor of the industry	**120**
			2.Second Assessment at the Industry (After 22 weeks)	Assessment of Learning outcomes by both the faculty and training Mentor of the industry	**120**
			Final Summative assessment at institution l (After 24 weeks)	Training Report	**20**
				Demonstration of any one of the skills listed in learning outcomes	**30**
				Viva Voce	**10**
TOTAL MARKS					**300**

- The Industrial Training shall carry 300 marks and pass mark is 50% in assessment at industry (first and second assessment put together) and in final summative assessment at institution put together
- If the student fails to secure 50% marks in final summative assessment at institution level, the student shall reappear for final summative assessment, in the subsequent board examination.
- During Industrial Training the candidate shall put in a minimum of 90% attendance. If the student fails to secure 90% attendance during industrial training, the student should reappear for 6 months industrial training.

FIRST YEAR

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTION AND MODEL BLUE PRINT FOR EVALUATION
CURRICULUM-2023
FIRST YEAR

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods Per Year	Scheme Of Examination			
		Theory	Practical		Duration (hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY								
C-101	English	3		90	3	20	80	100
C-102	Engineering Mathematics – I	5		150	3	20	80	100
C-103	Engineering Physics	3		90	3	20	80	100
C-104	Engineering Chemistry and Environmental studies	3		90	3	20	80	100
C-105	Engineering Mechanics	5		150	3	20	80	100
C-106	Surveying-I	4		120	3	20	80	100
PRACTICAL								
C-107	Engineering Drawing	-	6	180	3	40	60	100
C-108	Surveying - I Practice & Plotting	-	4	120	3	40	60	100
C-109	Physics Laboratory	-	3	45	1½	20	30	50
C-110	Chemistry Laboratory	-		45	1½	20	30	50
C-111	Computer Fundamentals Practice	-	3	90	3	40	60	100
	Student Centric Learning Activities		3	90				
	Total	**23**	**19**	**1260**		**280**	**720**	**1000**

[Note: C-101,102,103,104,109,110,111 are common with all branches

ENGLISH

Course Code	Course Title	No. of Periods per Week	Total No. of Periods	Marks for FA	Marks for SA
C-101	English	3	90	20	80

S. No.	Title of the Unit	No of Periods	COs Mapped
1	English for Employability	8	CO1, CO2, CO3, CO4,CO5
2	Living in Harmony	8	CO1, CO2, CO3, CO4,CO5
3	Connect with Care	8	CO1, CO2, CO3, CO4,CO5
4	Humour for Happiness	8	CO1, CO2, CO3, CO4, CO5
5	Never Ever Give Up!	8	CO1, CO2, CO3, CO4, CO5
6	Preserve or Perish	9	CO1, CO2, CO3, CO4, CO5
7	The Rainbow of Diversity	8	CO1, CO2, CO3, CO4, CO5
8	New Challenges- Newer Ideas	8	CO1, CO2, CO3, CO4, CO5
9	The End Point First	8	CO1, CO2, CO3, CO4, CO5
10	The Equal Halves	8	CO1, CO2, CO3, CO4, CO5
11	Dealing with Disaster	9	CO1, CO2, CO3, CO4, CO5
Total Periods		**90**	

Course Objectives	- To improve grammatical knowledge and enrich vocabulary.
	- To develop effective reading, writing and speaking skills.
	- To comprehend themes related to Personality, Society, Environment to exhibit Universal Human Values.

CO No.	Course Outcomes
CO1	Learn and apply various grammatical concepts to communicate in academic, professional and everyday situations
CO2	Use appropriate vocabulary in various contexts
CO3	Read and comprehend different forms of academic, professional and general reading material
CO4	Communicate effectively in speaking and writing in academic, professional and everyday situations.
CO5	Display human values by applying the knowledge of themes related to Self, Society, Environment, Science and Technology for holistic development and harmonious living through communication.

CO-PO Matrix

Course Code Common-101	**Course Title: English Number of Course Outcomes: 5**				**No. of Periods: 90**
POs	Mapped CO No.	CO Periods Addressing PO in Column 1		Level of Mapping (1,2,3)	Remarks
		Number	Percentage		
PO1		Not directly Applicable for English course, however, the language activities make use of the content from Science and Technology relevant to the programme to enhance English communication skills.			
PO2					
PO3					
PO4					
PO5	CO5	16	18%	Level 1	Up to 20%: Level 1 21%-50%: Level 2 >50%: Level 3
PO6	CO1, CO2, CO3, CO4,	52	58%	Level 3	
PO7	CO1, CO2, CO3, CO4,CO5	22	24%	Level 2	

Level 3 – Strongly Mapped, Level 2- Moderately Mapped; Level 1- Slightly Mapped

Learning Outcomes

1. English for Employability

1.1. Perceive the need for improving communication in English for employability
1.2. Use adjectives and articles effectively while speaking and in writing
1.3. Write simple sentences

2. Living in Harmony

2.1. Develop positive self-esteem for harmonious relationships
2.2. Use affixation to form new words
2.3. Use prepositions and use a few phrasal verbs contextually

3. Connect with Care

3.1. Use social media with discretion
3.2. Speak about abilities and possibilities
3.3. Make requests and express obligations
3.4. Use modal verbs and main verbs in appropriate form
3.5. Write short dialogues about everyday situations

4. Humour for Happiness

4.1. Realize the importance of humour for a healthy living
4.2. Improve vocabulary related to the theme
4.3. Inculcate reading and speaking skills
4.4. Frame sentences with proper Subject – Verb agreement
4.5. Understand the features of a good paragraph and learn how to gather ideas as a preliminary step for writing a good paragraph.

5. Never Ever Give Up!

5.1. Learn to deal with failures in life
5.2. Use the present tense form for various every day communicative functions such as speaking and writing about routines, professions, scientific descriptions and sports commentary
5.3. Write paragraphs with coherence and other necessary skills

6. Preserve or Perish

6.1. Understand the ecological challenges that we face today and act to save the environment.
6.2. Narrate / Report past events and talk about future actions
6.3. Develop vocabulary related to environment
6.4. Write e-mails

7. The Rainbow of Diversity

7.1. Appraise and value other cultures for a happy living in multi-cultural workspace
7.2. Understand the usage of different types of sentences
7.3. Ask for or give directions, information, instructions
7.4. Use language to express emotions in various situations

7.5. Write letters in various real life situations

8. New Challenges – Newer Ideas

8.1. Understand the functional difference between Active Voice and Passive Voice
8.2. Use Passive Voice to speak and write in various contexts
8.3. Understand the major parts and salient features of an essay
8.4. Learn about latest innovations and get motivated

9. The End Point First!

9.1. Understand the importance of setting goals in life
9.2. Report about what others have said both in speaking and writing
9.3. Write an essay following the structure in a cohesive and comprehensive manner
9.4. Apply the words related to Goal Setting in conversations and in life

10. The Equal Halves

10.1. Value the other genders and develop a gender-balanced view towards life
10.2. Identify the use of different conjunctions in synthesising sentences
10.3. Write various types of sentences to compare and contrast the ideas
10.4. Apply the knowledge of sentence synthesis in revising and rewriting short essays
10.5. Develop discourses in speech and writing

11. Dealing with Disasters

11.1. be aware of different kinds of disasters and the concept of disaster management
11.2. Generate vocabulary relevant to disaster management and use it in sentences
11.3. Analyze an error in a sentence and correct it
11.4. Learn and write different kinds of reports

Textbook: **'INTERACT'** (A Text book of English for I Year Engineering Diploma Courses) - by SBTET, AP

Reference Books:

Martin Hewings: *Advanced Grammar in Use,* Cambridge University Press
Murphy, Raymond : *English Grammar in Use,*Cambridge University Press
Sidney Greenbaum : *Oxford English Grammar*, Oxford University Press
Wren and Martin (Revised by N.D.V. Prasad Rao) : *English Grammar and Composition*, Blackie ELT Books, S. Chand and Co.
Sarah Freeman: *Strengthen Your Writing*, Macmillan

	End Exam (80 Marks)	**1,2,3 Unit Tests (20 Marks each)**
Part A	10 Question @ 3 Marks	5 Questions @ (1Q X4M) + (4Q X3M =12)
	Total = 30 Marks	Total = 16 Marks

Part B	5 Questions (+ 3 Choice) @10 Marks	3 Questions (with internal choice) @ 8 Marks
	Total = 50 Marks	Total = 24 marks
Grand Total	**80 Marks**	**40 Marks**

Time Schedule : C23-Common- 101 : ENGLISH						
S.no.	Title of the Unit	Periods allotted	Weightage of Marks	No. of Short answer questions	No. of Long Answer questions	Mapping of COs
1	English for Employability	8	16	2	1	CO1, CO2, CO3, CO4, CO5
2	Living in Harmony	8			2	CO1, CO2, CO3, CO4, CO5
3	Connect with Care	8	26	2		CO1, CO2, CO3, CO4, CO5
4	Humour for Happiness	8				CO1, CO2, CO3, CO4, CO5
5	Never Ever Give Up!	8	10	1	1	CO1, CO2, CO3, CO4, CO5
6	Preserve or Perish	9	23		2	CO1, CO2, CO3, CO4, CO5
7	The Rainbow of Diversity	8		2		CO1, CO2, CO3, CO4, CO5
8	New Challenges -Newer Ideas	8	19		1	CO1, CO2, CO3, CO4, CO5
9	The End Point First	8		1		CO1, CO2, CO3, CO4, CO5
10	The Equal Halves	8	16	1	1	CO1, CO2, CO3, CO4, CO5
11	Dealing with Disaster	9		1		CO1, CO2, CO3, CO4, CO5
	Total	**90**	**110**	**30**	**80**	

C23-Common-101 :English : Bifurcation of Syllabus for UNIT TESTS 1,2,3			
Unit Test	**Lessons / Chapters**	**Grammar / Language aspects (Topics or Short Answer questions)**	**Writing Skills (Topics for Long answer/ Essay Questions)**
U.T 1	Chapters 1,2,3	a) articles & prepositions, b)Vocabulary: Affixes, synonyms, Antonyms, matching meanings, words & phrases, one word substitutes) c)Adjectives (degrees of comparison) d) Main& Auxiliary Verbs e) phrasal verbs/ word order	a) Theme based Paragraph (focus on LSRW skills, importance of English, Self-esteem, SWOC analysis, Social media) b) Dialogue on themes of lessons 2&3 / Dialogue on General topic / a situation c) Reading comprehension
U.T 2	Chapters 4,5,6,7	a) concord b) Tenses c) Types of sentences d) Framing questions e) words &phrases, linkers	a) Theme based paragraph (Humour for happy living, learning from failures, Environmental protection, multi- culture /global culture) b) Letter writing (formal& informal), c) instructions/ directions, E-mail writing
U.T 3	Chapters 8,9,10,11	a) Voice (active &passive) b) Speech(direct& indirect) c) Synthesis of sentences (simple, complex, compound sentences) d) Error analysis e) words &phrases, linkers	a) Theme based paragraph/ Essay writing (Technical innovations, Goal setting, gender sensitivity, dealing with disaster) b) Essay writing, Report writing c) Reading Comprehension
Unit Test Question Paper pattern (40 Marks)	Total 40 Marks (Part A=16 Part B =24)	Short Answer questions (Part-A) Q. 1 = 4 marks Q. 2 to 5 = 3 Marks each Total=16 Marks	Long Answer Questions: (Part-B) Q. 6,7,8 @ 8 marks each ; Each question with Internal choice Total: 8X3 = 24 Marks

ENGINEERING MATHEMATICS-I

Course Code	Course Title	No. of Periods/week	Total No. of periods	Marks for FA	Marks for SA
C-102	Engineering Mathematics-I	5	150	20	80

S.No.	Unit Title	No. of periods	COs mapped
1	Algebra	31	CO1
2	Trigonometry	44	CO2
3	Co-ordinate Geometry	23	CO3
4	Differential Calculus	34	CO4
5	Applications of Derivatives	18	CO5
Total Periods		**150**	

Course Objectives	(i) To apply the principles of Algebra, Trigonometry and Co-ordinate Geometry to real-time problems in engineering. (ii) To comprehend and apply the concept of Differential Calculus in engineering applications.

Course Outcomes	CO1	Identify functions as special relations, resolve partial fractions and solve problems on matrices and determinants.
	CO2	Solve problems using the concept of trigonometric functions, their inverses and complex numbers.
	CO3	Find the equations and properties of straight lines, circles and conic sections in coordinate system.
	CO4	Evaluate the limits and derivatives of various functions.
	CO5	Find solutions for engineering problems using differentiation.

Learning Outcomes:

UNIT - I

C.O. 1 Identify functions, resolve partial fractions and solve problems on matrices and determinants.

L.O. 1.1 Define Set, Ordered pair and Cartesian product of two sets - examples.

1.2 Explain Relations and Functions – examples

1.3 Find Domain & Range of functions – simple examples.

1.4 Define one-one and onto functions.

1.5 Find the inverse of a function – simple examples.

1.6 Define rational, proper and improper fractions of polynomials.

1.7 Explain the procedure of resolving proper fractions of the types mentioned below into partial fractions

$i)$ $\dfrac{f(x)}{(ax+b)(cx+d)}$ $ii)$ $\dfrac{f(x)}{(ax+b)^2(cx+d)}$

1.8 Define a matrix and order of a matrix.

1.9 State various types of matrices with examples (emphasis on 3rd order square matrices).

1.10 Compute sum, difference, scalar multiplication and product of matrices. Illustrate the properties of these operations such as commutative, associative and distributive properties with examples and counter examples.

1.11 Define the transpose of a matrix and state its properties – examples.

1.12 Define symmetric and skew-symmetric matrices with examples. Resolve a square matrix into a sum of symmetric and skew-symmetric matrices and provide examples.

1.13 Define determinant of a square matrix; minor, co-factor of an element of a 3x3 square matrix with examples. Expand the determinant of a 3 x 3 matrix using Laplace expansion formula. State and apply the properties of determinants to solve problems.

1.14 Distinguish singular and non-singular matrices. Define multiplicative inverse of a matrix and list properties of adjoint and inverse. Compute adjoint and multiplicative inverse of a square matrix.

1.15 Solve a system of 3 linear equations in 3 unknowns using Cramer's rule and matrix inversion method.

UNIT - II

C.O. 2 Solve problems using the concept of trigonometric functions, their inverses and complex numbers.

L.O. 2.1 Define trigonometric ratios of any angle - List the values of trigonometric ratios at specified values.

2.2 Draw graphs of trigonometric functions - Explain periodicity of trigonometric functions.

2.3 Define compound angles and state the formulae of sin(A±B), cos(A±B), tan(A±B) and cot(A±B).

2.4 Give simple examples on compound angles to derive the values of $\sin 15^0$, $\cos 15^0$, $\sin 75^0$, $\cos 75^0$, $\tan 15^0$, $\tan 75^0$ etc.

2.5 Derive identities like $\sin(A+B)\sin(A-B) = \sin^2 A - \sin^2 B$ etc.

2.6 Solve simple problems on compound angles.

2.7 Derive the formulae of multiple angles 2A, 3A etc and sub multiple angle A/2 in terms of angle A of trigonometric functions.

2.8 Derive useful allied formulae like $\sin^2 A = (1 - \cos 2A)/2$ etc.

2.9 Solve simple problems using the multiple and submultiple formulae.

Syllabus for Unit test-I

completed

2.10 Derive the formulae on transforming sum or difference of two trigonometric ratios in to a product and vice versa - examples on these formulae.

2.11 Solve problems by applying these formulae to sum or difference or product of two terms.

2.12 Explain the concept of the inverse of a trigonometric function by selecting an appropriate domain and range.

2.13 Define inverses of six trigonometric functions along with their domains and ranges.

2.14 Derive relations between inverse trigonometric functions so that the given inverse trigonometric function can be expressed in terms of other inverse trigonometric functions with examples.

2.15 State various properties of inverse trigonometric functions and identities like $\sin^{-1}x+\cos^{-1} x = \frac{\pi}{2}$, etc.

2.16 Apply formulae like $\tan^{-1} x + \tan^{-1} y = \tan^{-1}\left(\frac{x+y}{1-xy}\right)$, *where* $x \geq 0, y \geq 0, xy < 1$ etc., to solve Simple problems.

2.17 Explain what is meant by solution of trigonometric equations and find the general solutions of sin x=k, cos x =k and tan x=k with appropriate examples.

2.18 Solve models of the type $a \sin^2 x + b \sin x + c=0$ and $a \sin x + b \cos x=c$.

2.19 State sine rule, cosine rule, tangent rule and projection rule and solve a triangle using these formulae.

2.20 List various formulae for the area of a triangle with examples.

2.21 Define a complex number, its modulus, conjugate, amplitude and list their properties.

2.22 Define arithmetic operations on complex numbers with examples.

2.23 Represent the complex number in various forms like modulus-amplitude (polar) form, Exponential (Euler) form with examples.

UNIT - III

Coordinate Geometry

C.O. 3 Find the equations and properties of straight lines, circles and conic sections in coordinate system.

L.O. 3.1 Write different forms of a straight line – general form, point-slope form, slope-intercept form, two-point form, intercept form and normal form (or perpendicular form).

3.2 Find distance of a point from a line, acute angle between two lines, intersection of two non-parallel lines and distance between two parallel lines.

3.3 Define locus of a point and circle.

3.4 Write the general equation of a circle and find its centre and radius.

3.5 Find the equation of a circle, given (i) centre and radius, (ii)two ends of the diameter (iii) three non collinear points of type (0,0) (a,0), (0, b).

3.6 Define a conic section - Explain the terms focus, directrix, eccentricity, axes and latus-
rectum of a conic with illustrations.

3.7 Find the equation of a conic when focus, directrix and eccentricity are given.

3.8 Describe the properties of Parabola, Ellipse and Hyperbola in standard forms whose axes are along the co-ordinate axes and solve simple examples on these conics.

Syllabus for Unit test-II completed

C.O.4 Evaluate the limits and derivatives of various functions.

L.O. 4.1 Explain the concept of limit and meaning of $\lim_{x\to a} f(x)=l$ and state the properties of limits.

4.2 Evaluate the limits of the type $\lim_{x\to a}\frac{f(x)}{g(x)}$ and $\lim_{x\to\infty}\frac{f(x)}{g(x)}$

4.3 State the Standard limits $\lim_{x\to a}\frac{x^n-a^n}{x-a}$, $\lim_{x\to 0}\frac{\sin x}{x}$, $\lim_{x\to 0}\frac{\tan x}{x}$, $\lim_{x\to 0}\frac{a^x-1}{x}$, $\lim_{x\to 0}\frac{e^x-1}{x}$, $\lim_{x\to 0}(1+x)^{\frac{1}{x}}$, $\lim_{x\to\infty}\left(1+\frac{1}{x}\right)^x$ (without proof) and solve simple problems using these standard limits.

4.4 Explain the concept of continuity of a function at a point and on an interval

4.5 State the concept of derivative of a function y = f(x) – definition, first principle as $\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ and also provide standard notations to denote the derivative of a function.

4.6 Explain the significance of derivative in scientific and engineering applications.

4.7 Find the derivative of standard algebraic, logarithmic, exponential and trigonometric functions using the first principle.

4.8 Find the derivatives of inverse trigonometric, hyperbolic and inverse hyperbolic functions.

4.9 State the rules of differentiation of sum, difference, scalar multiplication, product and quotient of functions with simple illustrative examples.

4.10 Explain the method of differentiation of a function of a function (Chain rule) with illustrative examples.

4.11 Explain the method of differentiation of parametric functions with examples.

4.12 Explain the procedure for finding the derivatives of implicit functions with examples.

4.13 Explain the need of taking logarithms for differentiating some functions of $[f(x)]^{g(x)}$ type – examples on logarithmic differentiation.

4.14 Explain the concept of finding the second order derivatives with examples.

4.15 Explain the concept of functions of several variables, finding partial derivatives and difference between the ordinary and partial derivatives with simple examples.

4.16 Explain the concept of finding second order partial derivatives with simple problems.

C.O. 5 Evaluate solutions for engineering problems using differentiation

L.O. 5.1 State the geometrical meaning of the derivative - Explain the concept of derivative to find the slopes of tangent and normal to a given curve at any point on it with examples.

5.2 Find the equations of tangent and normal to to a given curve at any point on it – simple problems.

5.3 Explain the derivative as a rate of change in distance-time relations to find the velocity and acceleration of a moving particle with examples.

5.4 Explain the derivative as a rate measurer in the problems where the quantities like areas, volumes vary with respect to time- illustrative examples.

5.5 Define the concept of increasing and decreasing functions - Explain the conditions to find points where the given function is increasing or decreasing with illustrative examples.

5.6 Explain the procedure to find the extreme values (maxima or minima) of a function of single variable- simple problems for quadratic and cubic polynomials.

5.7 Apply the concept of derivatives to find the errors and approximations - simple problems.

Syllabus for Unit test-III completed

CO/PO – Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	3				3	2	2
CO2	3	3	2	2				3	2	2
CO3	3	3	2	2				3	2	2
CO4	3	3	3	3				3	3	3
CO5	3	3	3	3				3	3	3
Avg.	3	2.8	2.4	2.6				3	2.4	2.4

3 = Strongly mapped (High), **2 =**moderately mapped (Medium), **1 =**slightly mapped (Low)

Note: The gaps in CO/PO mapping can be met with appropriate activities as follows:

For PO5: Appropriate quiz programmes may be conducted at intervals and duration as decided by concerned faculty.

For PO6: Seminars on applications of mathematics in various engineering disciplines are to be planned and conducted.

For PO7: Plan activities in such a way that students can visit the Library to refer standard books on Mathematics and access the latest updates in reputed national and international journals. Additionally, encourage them to attend seminars and learn mathematical software tools.

PO- CO – Mapping strength

PO No	Mapped with CO no	CO periods addressing PO in column I		Level (1,2 or 3)	Remarks
		No	%		
1	CO1, CO2, CO3, CO4, CO5	150 (31+44+23+34+18)	100%	3	>40% Level 3 Highly addressed 25% to 40% Level 2 Moderately addressed 5% to 25% Level 1 Low addressed <5% Not addressed
2	CO1, CO2, CO3, CO4, CO5	80 (8+23+12+22+15)	53.3%	3	
3	CO1, CO2, CO3, CO4, CO5	61 (9+14+9+14+15)	40.6%	3	
4	CO1, CO2, CO3, CO4, CO5	61 (14+9+9+14+15)	40.6%	3	
PSO 1	CO1, CO2, CO3, CO4, CO5	150 (31+44+23+34+18)	100%	3	
PSO 2	CO1, CO2, CO3, CO4, CO5	62 (10+14+9+14+15)	41.3%	3	
PSO 3	CO1, CO2, CO3, CO4, CO5	62 (10+14+9+14+15)	41.3%	3	

COURSE CONTENT

Unit-I

Algebra

1. **Functions**:

Definitions of Set, Ordered pair, Cartesian product of two sets, Relations, Functions, Domain & Range of functions – One-one and onto functions, inverse of a function.

2. **Partial Fractions:**

Definitions of rational, proper and improper fractions of polynomials. Resolve rational fractions (proper fractions) into partial fractions covering the types mentioned below.

$i)\quad \dfrac{f(x)}{(ax+b)(cx+d)}$ $\qquad ii)\quad \dfrac{f(x)}{(ax+b)^2(cx+d)}$

3. **Matrices:**

Definition of a matrix, types of matrices - Algebra of matrices, equality of two matrices, sum, difference, scalar multiplication and product of matrices. Transpose of a matrix, Symmetric, skew-symmetric matrices - Determinant of a square matrix, Minor and cofactor of an element, , Laplace's expansion, properties of determinants - Singular and non-singular matrices, Adjoint and multiplicative inverse of a square matrix-System of linear equations in 3 variables-Solutions by Cramer's rule and Matrix inversion method.

Unit-II
Trigonometry

4. **Trigonometric ratios:**
   Definition of trigonometric ratios of any angle, values of trigonometric ratios at specified values, draw graphs of trigonometric functions, periodicity of trigonometric functions.
5. **Compound angles:**
   Formulas of sin(A±B), cos(A±B), tan(A±B), cot(A±B), and related identities.
6. **Multiple and sub multiple angles:**
   Formulae for trigonometric ratios of multiple angles 2A, 3A and sub multiple angle A/2.
7. **Transformations:**
   Transformations of products into sums or differences and vice versa.
8. **Inverse trigonometric functions:**
   Definition, domains and ranges-basic properties.
9. **Trigonometric equations:**
   Concept of a solution, principal value and general solution of trigonometric equations: Sinx =k, cosx= k, tanx =k, where k is a constant. Solutions of simple quadratic equations and equations of type a sin x + b cos x=c.
10. **Properties of triangles:**
    Relations between sides and angles of a triangle- sine rule, cosine rule, tangent rule and projection rule-area of a triangle.
11. **Complex Numbers:**
    Definition of a complex number, modulus, conjugate and amplitude of a complex number - Arithmetic operations on complex numbers - Modulus-Amplitude (polar) form,
    Exponential form (Euler form) of a complex number.

UNIT-III
Coordinate geometry

12 **Straight lines:** Various forms of a straight line - Angle between two lines, perpendicular distance from a point, intersection of non-parallel lines and distance between parallel lines.
13. **Circle:** Locus of a point, Circle definition - Circle equation given (i) centre and radius, (ii)
    two ends of a diameter (iii) three non-collinear points of type (0,0), (a,0), (0, b) - General equation of a circle –its centre and radius.
14. Definition of a conic section - Equation of a conic when focus, directrix and eccentricity are given - Properties of parabola, ellipse and hyperbola in standard forms.

UNIT-IV
Differential Calculus

15. **Concept of Limit-** Definition and Properties of Limits and Standard Limits - Continuity of a function at a point.
16. **Concept of derivative-** Definition (first principle)- different notations - Derivatives of standard algebraic, logarithmic, exponential, trigonometric, inverse trigonometric, hyperbolic and inverse hyperbolic functions - Derivatives of sum, difference, scalar multiplication, product, quotient of functions - Chain rule, derivatives of parametric functions, derivatives of implicit functions, logarithmic differentiation - Second order derivatives - Functions of several variables, first and second order partial derivatives.

UNIT-V

Applications of Derivatives

17. Geometrical meaning of the derivative, equations of tangent and normal to a curve at any point.
18. Physical applications of derivatives – Velocity, acceleration, derivative as a rate measurer.
19. Applications of the derivative to find the extreme values – Increasing and decreasing functions, maxima and minima for quadratic and cubic polynomials.
20. Absolute, relative and percentage errors - Approximate values due to errors in measurements.

Textbook:

Engineering Mathematics-I, a textbook for first year diploma courses, prepared & prescribed by SBTET, AP.

Reference Books:

1. Shanti Narayan, A Textbook of matrices, S.Chand&Co.
2. Robert E. Moyer & Frank Ayers Jr., Schaum's Outline of Trigonometry, 4th Edition, Schaum's Series.
3. G.B.Thomas, R.L.Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Edition, 1995.
4. Frank Ayers & Elliott Mendelson, Schaum's Outline of Calculus, Schaum's Series.
5. M.Vygodsky, Mathematical Handbook, Mir Publishers, Moscow.

TIME SCHEDULE

S.No.	Chapter	No. of Periods	Marks Allotted	Short type	Essay type	COs mapped
Unit - I: Algebra						
1	Functions	6	3	1	0	CO1
2	Partial Fractions	5	3	1	0	CO1
3	Matrices and Determinants	20	16	2	1	CO1
Unit - II: Trigonometry						
4	Trigonometric Ratios	2	0	0	0	CO2
5	Compound Angles	5	3	1	0	CO2
6	Multiple and Submultiple angles	8	3	1	0	CO2
7	Transformations	6	5	0	1/2	CO2
8	Inverse Trigonometric Functions	6	5	0	1/2	CO2
9	Trigonometric Equations	6	5	0	1/2	CO2
10	Properties of triangles	5	5	0	1/2	CO2
11	Complex Numbers	6	3	1	0	CO2
Unit III: Co-ordinate Geometry						
12	Straight Lines	5	3	1	0	CO3
13	Circles	6	5	0	1/2	CO3
14	Conic Sections	12	5	0	1/2	CO3
Unit – IV: Differential Calculus						
15	Limits and Continuity	6	3	1	0	CO4
16	Differentiation	28	23	1	2	CO4
Unit – V: Applications of Derivatives						
17	Geometrical Applications	4	5	0	1/2	CO5
18	Physical Applications	6	5	0	1/2	CO5
19	Maxima and Minima	4	5	0	1/2	CO5
20	Errors and Approximations	4	5	0	1/2	CO5
	Total	150	110	10	8	
			Marks	30	80	

ENGINEERING PHYSICS

Course code	Course title	No.of periods per week	Total no. of periods	Marks for FA	Marks for SA
C -103	Engineering Physics	03	90	20	80

TIME SCHEDULE

S.No	Major topics	No. of Periods	Weightage of Marks	Short Answer type (3 marks)	Essay type (10 marks)	COs mapped
1.	Units and measurements	09	03	1		CO1
2.	Statics	11	13	1	1	
3.	Gravitation	12	20	1	2	CO2
4.	Concepts of energy	10	13	1	1	
5.	Thermal physics	10	13	1	1	CO3
6.	Sound	12	16	2	1	
7.	Electricity &Magnetism	13	16	2	1	CO4
8.	Modern physics	13	16	2	1	
	Total:	**90**	110	10	8	

Course title : Engineering Physics	
Course objectives	(1) To understand the basic concepts of physics for various Engineering applications as required for industries. (2) To equip the students with the scientific advances in technology and make the student suitable for any industrial or scientific organization.

COURSE OUTCOMES	CO1	Familiarize with various physical quantities, their SI units and errors in measurements; understand the concepts of vectors and various forces in statics.
	CO2	Understand the concepts of gravitation with reference to applications in satellites, provide the knowledge of various forms of energy and their working principles.
	CO3	Familiarize with the knowledge of transmission of heat and gas laws; provide the knowledge on musical sound and noise as pollution and also the concepts of echo and reverberation.
	CO4	Provide basic knowledge of electricity and concepts of magnetism and magnetic materials; familiarize with the advances in Physics such as photoelectric ell, optical fibers, semiconductors, superconductors and nanotechnology.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	1			2	2		2
CO2	3	2	2	2	2		2	1		2
CO3	2		1		2		1		1	1
CO4	3	2	3	2	2		3	2		2

MATRIX SHOWING MAPPING OF COURSE OUTCOMES WITH PROGRAMME OUTCOMES

CO-PO Mapping Strength

C -103	**Engineering Physics** **No of Course Objectives : 4**			**No of periods 90**
POs	Mapped with CO No	CO periods addressing PO in Col 1 NO %	Level 1,2,3	remarks
PO1	CO1,CO2,CO3,CO4	44 48.9 %	3	>40% level 3 (highly addressed) 25% to 40% level 2 (moderately addressed) 5% to 25% level 1 (Low addressed)
PO2	CO1,CO2, CO4	11 12.2%	1	
PO3	CO1, CO2,CO3, CO4	10 11.1%	1	
PO4	CO1, CO2,CO4	8 8.9%	1	
PO5	CO2,CO3, CO4	8 8.9%	1	

PO6					< 5% (not addressed)
PO7	CO1, CO2, CO3, CO4	9	10.0%	1	

3 = strongly mapped, 2 = moderately mapped, 1 = slightly mapped

Note: The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following.

(i) Seminars (ii) Tutorials (iii) Guest Lecturers (iv) Assignments
(v) Quiz competitions (vi) Industrial visits (vii) Tech fest
(viii) Mini project
(ix) Group discussions (x) Virtual classes (xi) Library visit for e-books

Learning outcomes

Upon completion of the course the student shall be able to

1.0 Understand the concept of units and measurements
1.1 Explain the concept of units
1.2 Define the terms
a) Physical quantity b) Fundamental physical quantities and
c) Derived physical quantities
1.3 Define unit
1.4 Define fundamental units and derived units
1.5 State SI units with symbols for fundamental and some derived quantities
1.6 State Multiples and Submultiples in SI system
1.7 State rules of writing S.I units
1.8 State advantages of SI units
1.9 What are direct and indirect measurements
1.10 Define accuracy and least count
1.11 Define error in measurement
1.12 Define absolute, relative and percentage errors with their formulae
1.13 Solve simple problems on absolute, relative and percentage errors

2.0 Understand the concepts of statics
2.1 Explain the concept of Vectors
2.2 Define scalar and vector quantities with examples
2.3 Represent vectors geometrically
2.4 Define the types of vectors (equal, negative, unit, co-initial, co-planar, position vector)
2.5 Resolve the vector into rectangular components
2.6 State and explain triangle law of addition of vectors
2.7 Define concurrent forces, co-planar forces and equilibrant.
2.8 State and explain Lami's theorem
2.9 State the parallelogram law of addition of forces with diagram.

2.10 Write the expressions for magnitude and direction of resultant (no derivation)
2.11 Illustrate parallelogram law with examples (i) flying of bird and (ii) working of sling.
2.12 Define moment of force and couple.
2.13 Write the formulae and S.I units of moment of force and couple.
2.14 Solve simple problems on (i) Resolution of force and
(ii) Parallelogram law of forces (finding R, α and θ).

3.0 Understand the concepts of Gravitation
3.1 State and explain Newton's universal law of gravitation.
3.2 Define G and mention its value.
3.3 Explain the acceleration due to gravity (g)
3.4 Explain the factors affecting the value of g
3.5 Derive the relationship between g and G.
3.6. State and explain the Kepler's laws of planetary motion
3.7 Define a satellite.
3.8 What are natural and artificial satellites, Give examples.
3.9 Define orbital velocity and write its formula.
3.10 Define escape velocity and write its formula.
3.11 Write a brief note on Polar satellites.
3.12 Write a brief note on Geo-stationary satellites.
3.13 Mention the applications of artificial satellites.
3.14 Solve simple problems on (i) Newton's law of gravitation and (ii) calculation of orbital
and escape velocities.

4.0 Understand the concepts of Energy.
4.1 Define work done and energy. Mention their SI units.
4.2 List various types of energy.
4.3 Define P.E with examples. Write its equation.
4.4 Define K.E with examples. Write its equation.
4.5 Derive relationship between K.E and momentum.
4.6 State the law of conservation of energy. Give various examples.
4.7 Write a brief note on solar energy.
4.8 Explain the principle of solar thermal conversion.
4.9 Explain the principle of photo voltaic effect
4.10 Solve simple problems on (i) work done (ii) P.E & K.E and (iii) Relation between K.E & momentum.

5.0 Understand the concepts of thermal physics
5.1 Define the concepts of heat and temperature
5.2 State different modes of transmission of heat
5.3 Explain conduction, convection and radiation with two examples each.
5.4 State and explain Boyle's law
5.5 Define absolute zero temperature
5.6 Explain absolute scale of temperature
5.7 State the relationship between degree Celsius, Kelvin and Fahrenheit temperatures
5.8 State Charle's law and write its equation
5.9 State Gay-Lussac's law and write its equation

5.10 Define ideal gas
5.11 Derive ideal gas equation
5.12 Explain why universal gas constant (R) is same for all gases in nature
5.13 Calculate the value of R for 1 gram mole of gas.
5.14 Solve simple problems on (i) Inter conversion of temperatures between °C, K and F (ii) Gas laws and (iii) Ideal gas equation.

6.0 Understand the concepts of Sound
6.1 Define the term sound
6.2 Define longitudinal and transverse waves with one example each
6.3 Explain the factors which affect the velocity of sound in air
6.4 Distinguish between musical sound and noise
6.5 Explain noise pollution and state SI unit for intensity of sound
6.6 Explain sources of noise pollution
6.7 Explain effects of noise pollution
6.8 Explain methods of minimizing noise pollution
6.9 Define Doppler effect.
6.10 List the Applications of Doppler effect
6.11 Define reverberation and reverberation time
6.12 Write Sabine's formula and name the physical quantities in it.
6.13 Define echoes and explain the condition to hear an echo.
6.14 Mention the methods of reducing an echo
6.15 Mention the applications of an echo
6.16 What are ultrasonics
6.17 Mention the applications of ultra sonics, SONAR
6.18 Solve simple problems on echo

7.0 Understand the concepts of Electricity and Magnetism
7.1 Explain the concept of P.D and EMF
7.2 State Ohm's law and write the formula
7.3 Explain Ohm's law
7.4 Define resistance and specific resistance. Write their S.I units.
7.5 State and explain Kichoff's first law.
7.6 State and explain Kirchoff's second law.
7.7 Describe Wheatstonebridge with legible sketch.
7.8 Derive an expression for balancing condition of Wheatstone bridge.
7.9 Describe Meter Bridge experiment with necessary circuit diagram.
7.10 Write the formulae to find resistance and specific resistance in meter bridge
7.11 Explain the concept of magnetism
7.12 What are natural and artificial magnets (mention some types)
7.13 Define magnetic field and magnetic lines of force.
7.14 Write the properties of magnetic lines of force
7.15 State and explain the Coulomb's inverse square law of magnetism
7.16 Define magnetic permeability
7.17 Define para, dia, ferro magnetic materials with examples
7.18 Solve simple problems on (i) Ohm's law (ii) Kirchoff's first law (iii) Wheatstone bridge (iv) meter bridge and (v) Coulomb's inverse square law

8.0 Understand the concepts of Modern physics

8.1 State and explain Photo-electric effect.
8.2 Write Einstein's Photo electric equation and name the physical quantities in it.
8.3 State laws of photo electric effect
8.4 Explain the Working of photo electric cell
8.5 List the Applications of photoelectric effect
8.6 Recapitulate refraction of light and its laws
8.7 Define critical angle
8.8 Explain the Total Internal Reflection
8.9 Explain the principle and working of Optical Fiber
8.10 List the applications of Optical Fiber
8.11 Explain the energy gap based on band structure
8.12 Distinguish between conductors, semiconductors and insulators based on energy gap
8.13 Define doping
8.14 Explain the concept of hole
8.15 Explain the types of semiconductors , Intrinsic and extrinsic
8.16 Explain n-type and p-type semiconductors
8.17 Mention the applications of semiconductors
8.18 Define superconductor and superconductivity
8.19 List the applications of superconductors
8.20 Nanotechnology definition, nano materials and applications

COURSECONTENT

1. Units and measurements

Introduction – Physical quantity – Fundamental and Derived quantities – Fundamental and derived units - SI units – Multiples and Sub multiples – Rules for writing S.I. units-Advantages of SI units – Direct and indirect measurements – Accuracy and least count – Errors : Absolute, relative and percentage errors –Problems.

2. Statics

Scalars and Vectors– Representation of a vector - Types of vectors - Resolution of vector into rectangular components – Triangle law of vectors – Concurrent forces - Lami's theorem - Parallelogram law of forces : Statement, equations for magnitude and direction of resultant, examples – Moment of force and couple – Problems.

3. Gravitation

Newton's law of gravitation and G – Concept of acceleration due to gravity (g) – Factors affecting the value of g – Relation between g and G- Kepler's laws – Satellites : Natural and artificial – Orbital velocity and escape velocity – Polar and geostationary satellites – Applications of artificial satellites – Problems.

4. Concepts of energy

Work done & Energy-Definition and types of energy - potential energy - kinetic energy- - K.E and momentum relation – Law of Conservation of energy, examples - Solar energy, principles of thermal and photo conversion – Problems.

5. Thermal physics

Modes of transmission of heat – Expansion of Gases - Boyle's law – Absolute scale of

temperature - Thermometric scales and their inter conversion - Charle's law - Gay-Lussac's law - Ideal gas equation - Universal gas constant (R) - Problems.

6. **Sound**

Sound - Nature of sound - Types of wave motion, Longitudinal and transverse – Factors affecting the velocity of sound in air - musical sound and noise - Noise pollution – Causes &effects - Methods of reducing noise pollution - Doppler effect - Echo-Reverberation -Reverberation time-Sabine 's formula – Ultrasonics & applications – SONAR - Problems.

7. **Electricity & Magnetism**

Concept of P.D and EMF - Ohm's law and explanation-Specific resistance - Kirchoff's laws – Wheat stone's bridge - Meter bridge.

Natural and artificial magnets – magnetic field and magnetic lines of force – Coulomb's inverse square law – Permeability – Magnetic materials – Para, dia, ferro – Examples – Problems.

8. **Modern Physics**

Photoelectric effect – laws of photoelectric effect – photoelectric cell – Applications of photoelectric cell - Total internal reflection - Fiber optics - Principle and working of an optical fiber - Applications of optical fibers – Semiconductors : Based on Energy gap – Doping – Hole - Intrinsic and extrinsic semiconductors (n-type & p-type) – Applications of semiconductors – Superconductivity – applications – Nanotechnology definition, nano materials, applications.

REFERENCES

1. Intermediate physics - Volume - I & 2 — Telugu Academy (English version)
2. Unified physics Volume 1, 2, 3 and 4 — Dr. S.L Guptha and Sanjeev Guptha
3. Concepts of Physics, Vol 1 & 2 — H.C. Verma
4. Text book of physics Volume I & 2 — Resnick & Halliday
5. Fundamentals of physics — Brijlal & Subramanyam
6. Text book of applied physics — Dhanpath Roy
7. NCERT Text Books of physics — Class XI & XII Standard
8. e-books/e-tools/websites/Learning Physics software/eLMS

Table showing the scope of syllabus to be covered for unit tests

Unit test	Learning outcomes to be covered
Unit test - 1	From 1.1 to 3.14
Unit test - 2	From 4.1 to 6.18
Unit test - 3	From 7.1 to 8.20

ENGINEERING CHEMISTRY AND ENVIRONMENTAL STUDIES

Course code	Course Title	No. of Periods per week	Total No. of Periods	Marks for FA	Marks for SA
C- 104	Engineering Chemistry and Environmental Studies	3	90	20	80

S.No	Unit Title/Chapter	No. of Periods	COs Mapped
1	Fundamentals of Chemistry	14	CO1
2	Solutions, Acids and Bases	16	CO1
3	Electrochemistry	12	CO2
4	Corrosion	8	CO2
5	Water Treatment	8	CO3
6	Polymers& Engineering Materials	12	CO4
7	Fuels	6	CO4
8	Environmental Studies	14	CO5
	Total	90	

Course Objectives

Course Title: Engineering Chemistry & Environmental Studies	
Course Objectives	1. To familiarize with the concepts of chemistry involved in the process of various Engineering Industrial Applications. 2. To know the various natural and man-made environmental issues and concerns with an interdisciplinary approach that include physical, chemical, biological and socio cultural aspects of environment. 3. to reinforce theoretical concepts by conducting relevant experiments/exercises

Course outcomes

Course Outcomes	CO1	Explain Bohr`s atomic model, chemical bonding, mole concept, acids and bases, P^H and Buffer solutions.
	CO2	Explain electrolysis, Galvanic cell, batteries and corrosion
	CO3	Explain the chemistry involved in the treatment of hardness in water.
	CO4	Explain the methods of preparation and applications of

		Polymers and Elastomers, chemical composition and applications of Alloys, Composite Materials, Liquid Crystals , Nano Materials and Fuels.
	CO5	Explain Global impacts due to air pollution, causes , effects and controlling methods of water pollution and understand the environment, forest resources, e-Pollution and Green Chemistry Principles.

C-104	Engineering. Chemistry and Environmental studies No of Course Outcomes:5				No Of periods 90
POs	Mapped with CO No	CO periods addressing PO in Col NO. 1	%	Level 1,2,3	remarks
PO1	CO1,CO2,CO3	42	46.7 %	3	>40% level 3 (highly addressed) 25% to 40% level 2(moderately addressed) 5% to 25% level 1 (Low addressed) < 5%(not addressed)
PO2	CO2,CO3	16	17.8%	1	
PO3	CO4	12	13.3%	1	
PO4	CO4	6	6.7%	1	
PO5	CO5	14	15.5%	1	
PO6					
PO7					

COs-POs mapping strength (as per given table)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	-	-	-	-	-
CO2	3	1	-	-	-	-	-
CO3	3	1	-	-	-	-	-
CO4	-	-	1	1	-	-	-
CO5	-	-	-	-	1	-	-
Average	3	1	1	1	1		-

3=strongly mapped 2= moderately mapped 1= slightly mapped

Note: The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:

i) Seminars ii) Tutorials iii) Guest Lectures iv) Assignments v) Quiz competitions vi) Industrial visit vii) Tech Fest viii) Mini project ix) Group discussions x) Virtual classes xi) Library visit for e-books

Time Schedule

S.No	Unit Title/Chapter	No of Periods	Weightage of marks	Question wise distribution		Mapped with CO
				Essay	Short	
1	Fundamentals of Chemistry	14	21	1½*	2	CO1
2	Solutions, Acids and Bases	16	21	1½*	2	CO1
3	Electrochemistry	12	13	1	1	CO2
4	Corrosion	8	13	1	1	CO2
5	Water Treatment	8	13	1	1	CO3
6	Polymers & Engineering materials.	12	13	1	1	CO4
7	Fuels	6	3	0	1	CO4
8	Environmental Studies	14	13	1	1	CO5
Total		90	110	8	10	

***One question of 10 marks should be given with 50% weightage from unit title 1and 2**

Upon completion of the course, the student shall be able to learn out

ENGINEERING CHEMISTRY AND ENVIRONMENTAL STUDIES

1.0 Atomic structure

1.1 Explain the charge, mass of fundamental particles of an atom (electron, proton and neutron) and the concept of atomic number and mass number.

1.2 State the Postulates of Bohr's atomic theory and its limitations.

1.3 Explain the significance of four Quantum numbers and draw the atomic structures of Silicon and Germanium.

1.4 Define Orbital of an atom and draw the shapes of s,p and d-orbitals.

1.5 Explain 1.Aufbau principle, 2.Pauli's exclusion principle 3. Hund's principle.

1.6 Write the electronic configuration of elements up to atomic number 30.

1.7 Explain the significance of chemical bonding.
1.8 Explain the Postulates of Electronic theory of valency.
1.9 Define and explain Ionic and Covalent bonds with examples of NaCl , *H_2,*O_2 and *N_2.(* Lewis dot method).
1.10 List out the Properties of Ionic compounds and covalent compounds and distinguish between their properties.

2.0 Solutions, Acids and Bases

2.1 Define the terms 1. Solution, 2. Solute and 3. Solvent.
2.2 Classify solutions based on solubility.
2.3 Define the terms 1. Atomic weight, 2. Molecular weight and 3. Equivalent weight. Calculate Molecular weight and Equivalent weight of the given acids (HCl, H_2SO_4, H_3PO_4) Bases (NaOH, $Ca(OH)_2$, $Al(OH)_3$ and Salts (NaCl, Na_2CO_3, $CaCO_3$).
2.4 Define mole and solve numerical problems on mole concept.
2.5 Define molarity, normality and solve numerical problems on molarity and normality.
a) Calculate the Molarity or Normality, if weight of solute and volume of solution are given.
b) Calculate the weight of solute, if Molarity or Normality with volume of solution are given.
c) Problems on dilution to convert high concentrated solutions to low concentrated solutions.
2.6 Explain Arrhenius theory f Acids and Bases and give its limitations.
2.7 Define ionic product of water, pH and solve numerical problems on pH (Strong Acids and Bases).
2.8 Define buffer solution and classify buffer solutions with examples. Give its applications.

3.0 Electrochemistry

3.1 Define the terms 1. Conductor 2. Semiconductor 3. Insulator, 4. Electrolyte 5. Non–electrolyte. Give two examples each.
3.2 Distinguish between Metallic conduction and Electrolytic conduction.
3.3 Explain electrolysis by taking an example of used NaCl and list out the applications of electrolysis.
3.4 Define Galvanic cell. Explain the construction and working of Galvanic cell.
3.5 Distinguish between electrolytic cell and galvanic cell.
3.6 Define battery and list the types of batteries with examples.
3.7 Explain the construction, working and applications of i) Dry cell (Leclanche cell), ii) Lead storage battery, iii) Lithium-Ion battery and iv) Hydrogen-Oxygen fuel cell.

4.0 Corrosion

4.1 Define the term corrosion.
4.2 state the Factors influencing the rate of corrosion.
4.3 Describe the formation of (a)composition cell (b) stress cell (c)concentration cell during corrosion.
4.4 Define rusting of iron and explain the mechanism of rusting of iron.
4.5 Explain the methods of prevention of corrosion by
(a)Protective coatings (anodic and cathodic coatings).
(b) Cathodic protection (Sacrificial anode process and Impressed–voltage process).

5. 0 Water Treatment

5.1 Define soft water and hard water with respect to soap action.
5.2 Define and classify the hardness of water.
5.3 List out the salts that causing hardness of water (with Formulae).
5.4 State the disadvantages of using hard water in industries.
5.5 Define Degree of hardness and units of hardness (mg/L and ppm).
5.6 Solve numerical problems on hardness.
5.7 Explain the methods of softening of hard water by (i) Ion-exchange process and (ii) Reverse Osmosis process.

6.0 Polymers & Engineering materials.

A) Polymers

6.1 Explain the concept of polymerization.
6.2 Describe the methods of polymerization (a) addition polymerization of ethylene (b) condensation polymerization of Bakelite (Only flowchart).
6.3 Define plastic. Explain a method of preparation and uses of the following plastics:
1. PVC 2. Teflon 3. Polystyrene 4. Nylon 6,6.
6.4 Define elastomers. Explain a method of preparation and applications of the following:
1. Buna- S 2. Neoprene.

B) Engineering Materials

6.5 Define an alloy. Write the composition and applications of the following:
1.Nichrome 2. Duralumin 3.Stainless Steel.
6.6 Define Composite Materials and give any two examples. State their Properties and applications.
6.7 Define Liquid Crystals and give any two examples. State their Properties and applications.
6.8 Define Nano Materials and give any two examples. State their Properties and applications.

7.0 Fuels

7.1 Define the term fuel.
7.2 Classify the fuels based on occurrence.
7.3 Write the composition and uses of the following:
1. LPG 2. CNG 3.Biogas 4.Power alcohol
7.4 Write the commercial production of Hydrogen as future fuel. Give its advantages and disadvantages.

8.0 ENVIRONMENTAL STUDIES

8.1 Explain the scope and importance of environmental studies.
8.2 Define environment. Explain the different segments of environment.
1.Lithosphere 2. Hydrosphere3. Atmosphere 4. Biosphere
8.3 Define the following terms:
1. Pollutant 2.Pollution 3.Contaminant 4. Receptor 5. Sink 6. Particulates 7. Dissolved oxygen (DO) 8. Threshold Limit Value (TLV) 9. BOD 10.COD 11. Eco system 12. Producers 13. Consumers 14. Decomposers with examples.
8.4 State the renewable and non- renewable energy sources with examples.
8.5 State the uses of forest resources.
8.6 Explain the causes and effects of deforestation.
8.7 Define air pollution and explain its Global impacts 1. Greenhouse effect, 2. Ozone layer depletion and 3. Acid rain.
8.8 Define Water pollution. Explain the causes, effects and controlling methods of Water

pollution.

8.9 Define e-Pollution, State the sources of e-waste. Explain its health effects and control methods.

8.10 Define Green Chemistry. Write the Principles and benefits of Green Chemistry.

COURSE CONTENT

ENGINEERING CHEMISTRY AND ENVIRONMENTAL STUDIES

1. **Fundamentals of Chemistry**

   Atomic Structure: Introduction - Fundamental particles – Bohr's theory – Quantum numbers – Atomic structure of Silicon and Germanium - Orbitals, shapes of s, p and d orbitals - Aufbau's principle - Hund's rule - Pauli's exclusion Principle -Electronic configuration of elements.

   Chemical Bonding: significance–Electronic theory of valency- Types of chemical bonds – Ionic and covalent bond with examples–Properties of Ionic and Covalent compounds.

2. **Solutions, Acids and Bases**

   Solutions: Types of solutions - Mole concept – Numerical problems on mole concept - Methods of expressing concentration of a solution – Molarity and Normality – Numerical problems on molarity and normality.

   Acids and Bases: Arrhenius theory of acids and bases – Ionic product of water- pH– Numerical problems on pH–Buffer solutions – Classification- applications.

3. **Electrochemistry**

   Conductors, semiconductors, insulators, electrolytes and non-electrolytes – Electrolysis of fused NaCl–Applications of electrolysis - Galvanic cell – Battery-Types- Dry Cell (Leclanche Cell), Lead- Storage battery- Lithium-Ion battery -Hydrogen-Oxygen Fuel cell.

4. **Corrosion**

   Introduction - Factors influencing corrosion - Composition, Stress and Concentration Cells– Rusting of iron and its mechanism – Prevention of corrosion by Protective Coating methods, Cathodic Protection methods.

5. **Water treatment**

   Introduction– Soft and Hard water– Causes of hardness– Types of hardness– Disadvantages of hard water – Degree of hardness (ppm and mg/lit) – Numerical problems on hardness - Softening methods – Ion-Exchange process– Reverse Osmosis process.

6. **Polymers & Engineering materials**

   Polymers:

   Concept of polymerization – Types of polymerization – Addition, condensation with examples – Plastics - Preparation and uses of i).PVC ii) Teflon iii) Polystyrene and iv) Nylon 6,6.

   Elastomers: Preparation and application of i)Buna-s and ii) Neoprene.

   Engineering Materials:

   Alloys- Composition and applications of i) Nichrome, ii) Duralumin and iii) Stainless Steel.

   Composite Materials- Properties and applications.

   Liquid Crystals- Properties and applications.

   Nano Materials- Properties and applications.

7. Fuels

Definition and classification of fuels – Composition and uses of i) LPG ii) CNG iii) Biogas

and iv) Power alcohol – Hydrogen as a future fuel-production- advantages and disadvantages.

8. ENVIRONMENTAL STUDIES

Scope and importance of environmental studies – Environment - Important terms related to environment–Renewable and non-renewable energy sources–Forest resources – Deforestation –Air pollution–Global impacts on environment –Water pollution – causes – effects – control measures- e-Pollution –Sources of e-waste - Health effects - Control methods - Green Chemistry- Principles -Benefits.

Table specifying the scope of syllabus to be covered for Unit Test- 1, Unit Test- 2 and Unit Test -3

Unit Test	**Learning outcomes to be covered**
Unit Test – 1	**From 1.1 to 2.8**
Unit Test – 2	**From 3.1 to 5.7**
Unit Test – 3	**From 6.1 to 8.10**

REFERENCE BOOKS

1. Telugu Academy — Intermediate chemistry Vol. 1&2
2. Jain & Jain — Engineering Chemistry
3. O.P. Agarwal, Hi-Tech. — Engineering Chemistry
4. D.K.Sharma — Engineering Chemistry
5. A.K. De — Engineering Chemistry

ENGINEERING MECHANICS

Course Code	Course Title	No. of Periods per Week	Total No. of Periods	Marks for Formative Assessment	Marks for Summative Assessment
C-105	ENGINEERING MECHANICS	05	150	20	80

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. of Periods	Weightage of marks	No. of Short Answer Questions	No. of Essay Questions	COs Mapped
1	Introduction	4	3	1	-	CO1
2	Forces & Moments	25	26	2	2	CO1
3	Centroid	18	13	1	1	CO2
4	Moment of Inertia	23	16	2	1	CO2
5	Simple Stresses and Strains	40	26	2	2	CO3
6	Shear force and Bending Moment	40	26	2	2	CO4
	Total	150	110	10	8	

COURSE OBJECTIVES:

Upon completion of the course the student shall be able to		
Course Objectives	(i)	Familiarize with the concepts of forces and their types, calculate the geometric properties like Centroid and moment of inertia... etc., for various sections

	(ii)	Acquire the concepts of simple stresses and strains and their applications, and their relevance to mechanical properties of metals
	(iii)	Understand the effect of loading on beams, analyses Shear Force and Bending Moment of simple beams

COURSE OUTCOMES:

Course Outcomes	CO 1	C 105.1	Explain the basic concepts of Engineering Mechanics and concept of different forces & moments and applying these principles for Civil Engineering problems.
	CO 2	C 105.2	Compute the Centroid, Centre of gravity, Moment of Inertia and Radius of gyration for various sections
	CO 3	C 105.3	Calculate the simple Stresses and Strains in structural materials
	CO4	C 105.4	Explain concepts of shear force and bending moments, Compute the SF, BM values and Draws the SFD and BMD for beams.

LEARNING OUTCOMES:

Learning Outcomes	**1.0 Introduction** 1.1 Define Mechanics and Engineering Mechanics 1.2 State the applications of Engineering Mechanics 1.3 State the branches of Engineering Mechanics 1.3 Define the terms 1.Statics, 2.Dynamics, 3.Kinetics and 4.Kinematics 1.4 List the systems of measurements and Units 1.5 List S.I and M.K.S units of physical quantities used in Civil Engineering **2.0 Forces and Moments** 2.1 Define the following terms:

	1. Force 2. Moment 3. Resultant 4. Equilibrium of forces 5. Equilibrant 6. Moment of a couple 2.2 Distinguish between 2.2.1 Scalar and Vector quantities 2.2.2 Co-planar and non-co-planar forces 2.2.3 Parallel and non-parallel forces 2.2.4 Like and unlike parallel forces 2.3 Compute the resultant of two co-planar forces acting at a point by 2.3.1 Law of parallelogram of forces and 2.3.2 Triangle law of forces 2.4 Explain 'Lami's Theorem' and 'Polygon Law of forces' 2.41 Solve simple problems using Lami's Theorem 2.5 Explain 'Polygon Law of forces' 2.5.1 Compute the resultant of a system of coplanar concurrent forces by Polygon Law of forces 2.5.2 Define 'Resolution of forces' 2.6. Solve problems on computation of the resultant of a system of coplanar parallel forces. 2.7. Explain the properties of a couple. 2.8. List the conditions of equilibrium of rigid body subjected to a number of co- planar forces. 2.8.1. Calculate resultant of co-planar concurrent forcesby

	analytical methods. **3.0 Centroid** 3.1 Define Centroid and Centre of gravity 3.2 Distinguish between Centroid and Centre of gravity 3.3 State the need for finding the Centroid and Centre of gravity for various engineering applications. 3.4 Calculate the positions of Centroid for simple plane figures from first principles 3.5 Explain the method of determining the Centroid by 'Method of moments'. 3.6 Calculate the position of Centroid of standard Sections-T, L, I, Channel section, Z section, unsymmetrical I section 3.7 Calculate the position of Centroid of built up sections consisting of RSJ's and flange plates and Plane figures having hollow portions **4.0. Moment of Inertia** 4.1 Define Moment of Inertia, Polar Moment of Inertia and Radius of gyration 4.2 State the necessity of finding Moment of Inertia for various engineering applications 4.3 Compute Moment of Inertia and Radius of gyration for regular geometrical sections like T, L, I, Channel section, Z section and unsymmetrical I section 4.4 State 1. Parallel axes theorem and 2. Perpendicular axes theorem to determine Moment of Inertia 4.5 Compute MI of standard sections by applying parallel axis theorem. 4.6 ComputeMI of built-up sections by applying parallelaxis theorem.

	4.7 Calculate radius of gyration of standard sections. 4.8 Compute Polar Moment of Inertia for solid and hollow circular Section by applying perpendicular axes theorem. **5.0. Simple Stresses and Strains** 5.1 Define the following terms: 1. Stress 2. Strain 3. Modulus of Elasticity 4. Longitudinal Strain 5. Lateral Strain 6. Poisson's ratio 7. Modulus of rigidity 8. Bulk Modulus 9. working stress, 10. Factor of safety 11. Resilience 12. Strain Energy 13. Proof resilience 14. Modulus of Resilience 5.2 Distinguish between different kinds of stresses and strains 5.3 Draw the stress-strain curve for ductile materials (Mild steel) and Henceexplain the salient points on the curve. 5.4 State Hooke's law and limits of proportionality, State the factors affecting factor of safety 5.5 Solve problems on relationship between simple stress

	and simple strain under axial loading on uniform bars and stepped bars. 5.6 State the relationship among the elastic constants, Solve problems on relationship between elastic constants. 5.7 Calculate stresses in simple and composite members under axial loading 5.8 Define temperature stress, strain, hoops stress. 5.9 List and explain mechanical properties of materials **6.0 Shear force and Bending moment** 6.1 Define a) Cantilever beam b) Simply supported beam c) Fixed beam d) Continuous beam e) Overhanging beam Define a) Point Load b) Uniformly Distributed Load Describe a) Roller support b) Hinged support c) Fixed support 6.2 Calculate reactions at rollers/hinged and fixed supportsfor 1. Simply Supported beams,

	2. Cantilever beams and 3. Overhanging beams. 6.3 Explain a)Shear Force and b) Bending Moment 6.4 Explain sign conventions used for drawing 1. Shear Force and2. Bending Moment 6.5 Deduce the relationship among the rate of loading, shear force and bending moment 6.6 Determine Shear Force and Bending Moments on Cantilever and Simply Supported beams for simple cases of loading (Point Load, Uniformly Distributed Load) analytically 6.7 Describe the procedures for sketching the Shear Force Diagrams (SFD) and Bending Moment Diagrams (BMD) 6.8 Sketch Shear Force Diagrams (SFD) and Bending Moment Diagrams (BMD) for Cantilever and Simply Supported Beams 6.9 Define point of contra flexure 6.10 Determine the Shear Force, Bending Moment and point of contraflexure for overhanging beams and sketch Shear Force Diagrams (SFD) and Bending Moment Diagrams(BMD) for overhanging beams

PO-CO MAPPING:

C-105	**ENGINEERING MECHANICS No. of COs: 04**				**No. of Periods: 150**
POs	**Mapped with CO Nos.**	**CO periods addressing PO in Col.1**		**Level (1,2,3)**	**Remarks**
		No.	**%**		
1	CO1, CO2, CO3, CO4	55	37	2	>40% Level.3 (Highly
2	CO1, CO2, CO3, CO4	65	43	3	

3	CO1, CO2, CO3, CO4	20	13	1	addressed) 25% - 40% Level.2 (Moderately addressed 5% - 25% Level.1 (Low addressed) <5% Not addressed
4	CO2	10	07	1	
5					
6					
7					

CO-PO MAPPING:

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2	2					2	3	1
CO2	2	2	2	1				2	3	1
CO3	3	3	3					2	3	1
CO4	3	3	2					2	3	1
Average	2.5	2.5	2.25	1				2	3	1

Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz

(vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc

COURSE CONTENT:

1. Introduction

Mechanics-Engineering Mechanics-Applications and branches of Engineering Mechanics - Statics, Dynamics, Kinetics and Kinematics - Systems of measurements and Units - S.I and M.K.S units of physical quantities used in Civil Engineering

2. Forces & Moments

Definition of force - Vectors and Scalars - Vector representation of a force - systems of forces - Co-planar forces - Resultant of forces at a point – Parallelogram Law and Triangle Law of forces – Lami's theorem – Polygon law of forces – Resolution of forces- Parallel forces – like and unlike forces – moment of a force - units and sense-couple-moment of a couple – properties of a couple - Conditions of equilibrium of a rigid body subjected to a number of co-planar forces.

3. Centroid

Definitions – Centroid - Centre of gravity - Position of Centroid of standard figures like rectangle, triangle, parallelogram circle, semi-circle and trapezium - Determination of location of Centroid of standard sections - T, L, I, Channel section, Z section and built up sections consisting of RSJs and flange plates and plane figures having hollow portion.

4. Moment of Inertia

Definition of Moment of Inertia - Perpendicular and parallel axes theorems – Moment of Inertia of standard sections like rectangle, triangle, circle and hallow circular sections - Moment of Inertia of built up sections- T, L, I, Channel section and Z sections using parallel axis theorem - Moment of Inertia and radius of gyration of built-up sections consisting of the combinations of RSJ's flange plates, channels & flange plates etc - Polar Moment of Inertia of solid and hallow circular sections using Perpendicular axis theorem

5. Simple Stresses and Strains

Stress and strain – type of stresses and strains - Stress strain curves for ductile materials- mild steel, elastic limit, limit of proportionality, yield point, ultimate stress; breaking stress; working stress, factor of safety – Factors affecting factor of safety - Hooke's law – Young's modulus – deformation under axial load - Shear stress and Shear Strain – Modulus of rigidity - Longitudinal and lateral strain - Poisson's ratio - Bulk Modulus – relationship between elastic constants (Proof not required, only problems) - Composite sections – Effect of axial loads - Temperature stresses, strains (No Problems) – Hoop stress - Resilience – strain energy-proof resilience and modulus of resilience - Mechanical properties of materials-elasticity, plasticity, ductility, brittleness, malleability, stiffness, hardness, toughness, creep, fatigue, examples of materials which exhibit the above properties.

6.0 Shear force and bending Moment

Beams – Types of beams – Cantilevers – Simply supported – Overhanging – Fixed and continuous -Types of supports – Roller – Hinged – Fixed - explanation of S.F and B.M. at a section- Relation between rate of loading SF and BM - Calculation of S.F. and B.M values at different sections for cantilevers Simply supported beams - overhanging beams under point loads and uniformly distributed loads, position and significance of points of contra flexure - Drawing S.F. and B.M diagrams by analytical methods – location of points of contra flexure.

REFERENCE BOOKS:

1. Engineering Mechanics, N. H. Dubey, Tata McGraw Hill
2. Engineering Mechanics, R.S. Kurmi, S. Chand and Company Limited
3. Engineering Mechanics, R.K. Singal, M. Singal, R.SingalI.K.International
4. Engineering Mechanics -Statics, P. Dayaratnam, Tata McGraw Hill

Table specifying the scope of syllabus to be covered for Unit Test-I, Unit Test-II& Unit Test -III

Unit Test	Learning outcomes to be covered
Unit Test-I	From 1.1 to 3.7
Unit Test-II	From 4.1 to 5.5
Unit Test –III	From 5.6 to 6.10

SURVEYING-I

Course Code	Course Title	No. of Periods per Week	Total No. of Periods	Marks for Formative Assessment	Marks for Summative Assessment
C-106	SURVEYING-I	04	120	20	80

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. of Periods	Weightage of marks	No. of Short Answer Questions	No. of Essay Questions	COs Mapped
1.	Introduction to Surveying	7	13	1	1	**CO1**
2.	Chain Surveying	27	26	2	2	**CO2**
3.	Compass Surveying	35	26	2	2	**CO3**
4.	Levelling	48	42	4	3	**CO4**
5.	Minor Instruments	03	3	1	-	**CO5**
	Total	**120**	110	10	8	

COURSE OBJECTIVES:

Upon completion of the course the student shall be able to		
	(i)	Acquire basic knowledge about principles of surveying for location, design and construction of engineering projects.

Course Objectives	(ii)	Develop skills in using basic surveying instruments like measuring chains, tapes, compass, levels & minor instruments

COURSE OUTCOMES:

Course Outcomes	CO1	C-106.1	State the fundamental principles of Surveying.
	CO2	C-106.2	Explain the principle of chain surveying and Perform the operations involved in chaining on flat and sloping grounds and when high ground intervenes, Practice chain triangulation/traversing for location survey.
	CO3	C-106.3	Describe the operations involved in field compass surveying like taking bearings and calculation of included angles & traversing.
	CO4	C-106.4	Explain the fundamental principles of levelling, tabulate the levelling field data, explain computation of reduced levels, different types of levelling, errors involved in levelling and contours.
	CO5	C-106.5	List the various minor instruments used in surveying and their uses.

LEARNING OUTCOMES:

Learning Outcomes	**1. Introduction to surveying** 1.1 State the concept of surveying. 1.2 State the purpose of surveying. 1.3 Distinguish between 1. Plane and 2. Geodetic surveying. 1.4 State the units of linear and angular measurements in Surveying and conversions. 1.5 List the instruments used for taking linear and angular measurements. 1.6 Classify different types of surveys.

	1.7 State the fundamental principles of surveying. **2.0 Chain Surveying** 2.1 State the purpose and principle of Chain surveying and explain the principles used in Chain triangulation. 2.2 List different instruments used in Chain Surveying and explain their functions. 2.3 List the six points to be followed while selecting the survey stations 2.4 Define ranging and explain methods of ranging a line. 2.5 State the duties of leader and follower while Chaining a line. 2.6 Describe in detail the method of setting out right angles with cross staff and optical square. 2.7 Explain Field work procedure in Chain survey and Method of recording field observations 2.8 List different sign conventions used in chain survey. 2.9 Explain the methods of overcoming different obstacles in chain surveying. (No Problems) 2.10 Calculate the areas of irregular boundaries using Average Ordinate rule, Trapezoidal rule and Simpson's rule. **3.0 Compass Surveying** 3.1 State the purpose and principles of Compass surveying. 3.2 Identify the parts of Prismatic Compass and state their functions 3.3 Define -Whole Circle Bearing, Quadrantal Bearing, True meridian, Magnetic meridian, True bearing, Magnetic bearing, Dip, Declination and Local attraction. 3.4 Convert Whole Circle Bearing in to Quadrantal Bearing and

	vice versa. 3.5 Explain local attraction and its effects. 3.6 Compute the included angles of lines in a Compass traverse and the true bearings of lines in a Compass traverse. 3.7 Explain the operations involved in field in compass Surveying. 3.8 Explain methods of recording field notes and plotting Compass Surveying. 3.9 Explain errors in Compass surveying. **4.0 Levelling** 4.1 Define levelling and List the types of levelling instruments, Define the terms -Datum or Datum plane, Reduced level, Level surface, Horizontal surface, Vertical Line and Station, Mean sea level ,Bench Mark 4.2 List the component parts of a dumpy level and their functions, explain the steps involved in temporary adjustments of a dumpy level, Define Back sight, Fore sight, Intermediate sight, Change Point. 4.3 List different types of levelling staves, tabulate the levelling field data, state methods of reducing levels, Compare height of instrument and Rise and fall methods, Compute reduced levels by height of instrument and Rise and fall methods, and apply check. 4.4 List the different types of Levelling and describe in detail Profile levelling 4.5 State the Errors in levelling and the Precautions to be taken to prevent errors in levelling, Explain the effect of Errors due to Curvature and Refraction and Combined error (No Problems) 4.6 List the errors eliminated in reciprocal levelling, Derive the formula for true difference in elevation and true error

	between two points, Calculate true difference in elevation and collimation error in reciprocal levelling 4.7 List the fundamental lines of dumpy level and state the relationship among fundamental lines of dumpy level 4.8 Define Contour, Contour interval and Horizontal equivalent, List the Characteristics and uses of contours, explain different methods of contouring and interpolation of contours **5.0 Minor Instruments** 5.1 Explain the need for using Minor instruments 5.2 List various minor instruments used in surveying 5.3 Explain the uses of the following minor instruments: 1. Abney Level, 2. Pentagraph and 3. Electronic Planimeter

PO-CO Mapping:

Course Code : C-106	**Course Title: Surveying – I** **Number of COs: 05**				**No. of Periods: 75**
POs	**Mapped with CO Nos**	**CO Periods addressing PO in Col. 1**		**Level (1,2,3)**	**Remarks**
		No	%		
PO1	CO1, CO2, CO3, CO4, CO5	55	47	3	> 40% Level 3 Highly addressed 25% to 40% Level 2 Moderately addressed 5 to 25% Level 1 Low addressed
PO2	CO2,C03,CO4	42	34	2	
PO3					
PO4	CO2, CO4	16	13	1	
PO5	CO2	7	6	1	
PO6					
PO7					

CO-PO Mapping:

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2							2	3	2
CO2	2	2		2	2			2	3	2
CO3	3	3						2	3	2
CO4	3	3		2				2	3	2
CO5	3							2	3	2
Average	**2.6**	**2.67**		**2**	**2**			**2**	**3**	**2**

Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz
(vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc

COURSE CONTENT:

1.0 Introduction to surveying

Definition-Concept of Surveying-purpose of Surveying-Divisions of surveying-Classification of Surveying based on different criteria– Fundamental principles in Surveying -Measurements- Units and conversions-Instruments used for taking linear and angular measurements.

2.0 Chain Surveying

Purpose and Principle of Chain Surveying -Suitability of Chain Surveying-Survey stations and their selection-Survey lines and offsets – Instruments used in Chain survey and their function - Ranging a survey line- direct ranging and Indirect ranging –Chaining a line – Duties of leader and follower- Setting out right angles with cross staff and Optical square-Cross staff survey Field work procedure- Recording field notes – field book -Conventional signs - Obstacles in chain survey -methods to overcome obstacles (No Problems) -Problems Calculations of area – different methods –Average ordinate, Trapezoidal and Simpson's rules.

3.0 Compass Surveying

Introduction, Purpose, principle and uses of compass Survey-Traverse-Open and Closed Traverse –Theory of magnetism-Description working and use of Prismatic compass-Operations in using Compass before taking readings - Concept of Meridian-Types of meridians-Bearing and angle- Designation of bearings- Whole Circle Bearing. Quadrantal Bearing Conversions-Field work in Compass Survey –field notes-traverse using prismatic compass -Local attraction-detection and correction, Dip and Magnetic declination- Variation of Magnetic declination -calculation of true bearings-Determination of included angles from the given bearings and vice versa in compass traverse - Precautions in using a Compass-Errors in Compass Surveying.

4.0 Levelling

Levelling – Types of levelling instruments – component parts of a dumpy level and their functions – Definitions of important terms used in Levelling – level surface, level line, plumb line, horizontal line, axis of telescope, line of collimation, back sight, fore sight, intermediate sight, station and change point – Temporary adjustments of a dumpy level – types of Levelling Staves - Bench marks – different types of bench marks - Booking of readings in field book – Determination of Reduced levels by height of instrument and Rise and Fall methods – Comparison of methods – Problems-Missing Entry - Calculations-Problems - Classification of Levelling – detailed description of profile levelling and reciprocal levelling - Errors due to curvature and refraction and combined correction (No problems)-Fundamental lines of dumpy level and their relations- Contouring – contour, contour interval and horizontal equivalent – Characteristics of contours – methods of contouring – Block contouring – Radial contouring – interpolation of contours – uses of Contour maps.

5.0 Minor instruments

Purpose of Minor instruments- Various minor instruments- Uses of Abney Level, Pentagraph and Electronic Planimeter.

REFERENCE BOOKS :

1) Surveying - I &II, - Dr.B.C. Punmia,Lakshmi Publications Pvt Ltd
2) Surveying-I &II, - Dr.K.R.Arora, Standard Book House
3) Surveying and levelling - I & II, T. P Kanetkar &S.V. Kulakarni,Pune Vidhyardhi Griha Prakasan`
4) Text book of surveying, Dr.C.Venktramaiah,Universities Press
5) Surveying& Levelling,N.N.Basak,TMH

Table specifying the scope of syllabus to be covered for Unit Test-I, Unit Test-II & Unit Test -III

Unit Test	Learning Outcomes to be covered
Unit Test – I	From 1.1 to 2.10
Unit Test – II	From 3.1 to 4.3
Unit Test – III	From 4.4 to 5.3

ENGINEERING DRAWING

Course Code	Course Title	No. of Periods per Week	Total No. of Periods	Marks for Formative Assessment	Marks for Summative Assessment
C-107	ENGINEERING DRAWING	06	180	40	60

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. of Periods	Weightage of marks	No. of Short Answer Questions	No. of Essay Questions	COs Mapped
1	Importance of Engineering Drawing	01	-	-	-	**CO1**
2	Engineering Drawing Instruments	05	-	-	-	**CO1**
3	Free hand lettering & Numbering	06	5	1	-	**CO1**
4	Dimensioning Practice	09	5	1	-	**CO1**
5	Geometrical constructions	21	15	1	1	**CO2**
6	Projections of points, Lines, Planes & Solids	21	10	-	1	**CO3**
7	Auxiliary views	6	5	1	-	**CO3**
8	Sections of Solids	27	10	-	1	**CO3**
9	Orthographic	33	10	-	1	**CO3**

	Projections					
10	Isometric Views	30	10	-	1	**CO4**
11	Development of surfaces	21	10	-	1	**CO5**
	Total	**180**	**80**	4	6	

COURSE OBJECTIVES:

Upon completion of the course the student shall able to	
Course Objectives	understand the basic graphic skills and use them in preparation of engineering drawings, their reading and interpretation

COURSE OUTCOMES:

Course Outcomes	CO1	C-107.1	Practice the use of engineering drawing instruments and Familiarise with the conventions to be followed in engineering drawing as per BIS
	CO2	C-107.2	Construct the i) basic geometrical constructions ii) engineering curves
	CO3	C-107.3	Visualise and draw the orthographic projections of i) Points ii) Lines iii) Regular Planes iv) Regular Solids V) Sections of Regular Solids .
	CO4	C-107.4	Visualise and draw the isometric views of objects .
	CO5	C-107.5	Draw the developments of surfaces of regular solids and thereby the components used in daily applications

LEARNING OUTCOMES:

Learning Outcomes	**1.0**	Understand the basic concepts of Engineering Drawing
	1.1	State the importance of drawing as an engineering communication medium
	1.2	State the necessity of B.I.S. Code of practice for

	Engineering Drawing. 1.3 Explain the linkages between Engineering drawing and other subjects of Mechanical Engineering **2.0 Use of Engineering Drawing Instruments** 2.1 Select the correct instruments to draw the different lines / curves 2.2 Use correct grade of pencil to draw different types of lines and for different purposes 2.3 Select and use appropriate scales for a given application. 2.4 Identify different drawing sheet sizes as per I.S. and Standard Lay- outs. 2.5 Prepare Title block as per B.I.S. Specifications. 2.6 Identify the steps to be taken to keep the drawing clean and tidy. Drawing Plate 1: (Having two exercises) **3.0 Write Free Hand Lettering and Numbers** 3.1 Write titles using sloping lettering and numerals of 7mm, 10mm and 14mm height 3.2 Write titles using vertical lettering and numerals of 7mm, 10mm and 14mm height 3.3 Select suitable sizes of lettering for different layouts and applications Drawing plate 2: (Having 5 to 6 exercises) **4.0 Understand Dimensioning Practice** 4.2 Acquaint with the conventions, notations, rules and methods of dimensioning in engineering drawing as per the B.I.S. 4.5 Dimension a given drawing using standard notations and desired system of dimensioning. Drawing Plate 3: (Having 08 to10 exercises) **5.0 Apply Principles of Geometric Constructions** 5.1 Practice the basic geometric constructions like i) dividing a line into equal parts ii) exterior and interior tangents to the given two circles iii) tangent arcs to two given lines and arcs 5.2 Draw any regular polygon using general method when i) side length is given ii) inscribing circle radius is given iii) describing circle radius is given 5.3 Draw the conics using general and special methods, 5.4 raw the engineering curves like i) involute

	ii) cycloid iii) helix 5.5 Identify the applications of the above constructions in engineering practice. Drawing Plate -4: Having problems up to construction of polygon Drawing Plate -5: Having problems of construction of conics Drawing Plate -6: Having problems of construction of involutes, cycloid and helix **6.0 Apply Principles of Projection of points, lines, planes &auxiliary planes** 6.1 Explain the basic principles of the orthographic projections 6.2 Visualise and draw the projection of a point with respect to reference planes (HP&VP) 6.3 Visualise and draw the projections of straight lines with respect to two reference Planes (up to lines parallel to one plane and inclined to another plane) 6.4 Visualise and draw the projections of planes (up to planes perpendicular to one plane and inclined to other plane) 6.5 Identify the need of Auxiliary views for a given engineering drawing. 6.6 Draw the auxiliary views of a given engineering component Drawing Plate -7: Having problems up to projection of points and Lines (15 exercises) Drawing Plate -8: Having problems of projection of planes (6 exercises) Drawing Plate -9: Having problems on auxiliary planes (Having 4 exercises) **7.0 Draw the Projections of Solids** 7.1 Visualise and draw the projections of solids (up to axis of solids parallel to one plane and inclined to other plane) Drawing plate No.10: Having problems of projection of solids (10 exercises) **8.0 Appreciate the need of Sectional Views** 8.1 Identify the need to draw sectional views. 8.2 Differentiate between true shape and apparent shape of section 8.3 Draw sectional views and true sections of regular solids by applying the principles of hatching. Drawing Plate–11: Having problems of section of solids (6 exercises) **9.0 Apply principles of orthographic projection**

	9.1 Draw the orthographic views of an object from its pictorial drawing. 9.2 Draw the minimum number of views needed to represent a given object fully. Drawing Plate 12 : (Having 10 to 12 exercises) **10.0 Prepare pictorial drawings** 10.1 identify the need of pictorial drawings. 10.2 Differentiate between isometric scale and true scale. 10.3 Prepare Isometric views for the given orthographic drawings. Drawing plate 13: (Having 10 to 12 exercises) **11.0 Interpret Development of surfaces of different solids** 11.1 State the need for preparing development drawing. 11.2 Draw the development of simple engineering objects (cubes, prisms, cylinders, cones, pyramid) using parallel line and radial line method. 11.3 Prepare development of surface of engineering components like i) funnel ii) 90^0 elbow Drawing plate No. 14: (Having 05 exercises)

PO-CO Mapping

Course Code : C-107	**Course Title ENGINEERING DRAWING Number of Course Outcomes: 05**				**No. of Periods 180**
POs	**Mapped with CO No.**	**CO Periods addressing PO in Column 1**		**Level (1,2,3)**	**Remarks**
		No	**%**		
PO1	CO1, CO2, CO3, CO4, CO5	12	7	1	>40% Level.3 (Highly addressed) 25% - 40% Level.2 (Moderately addressed) 5% - 25% Level.1 (Low addressed) <5% Not
PO2	CO1, CO2, CO3, CO4, CO5	12	7	1	
PO3	CO1, CO2, CO3, CO4, CO5	72	40	3	
PO4	CO1, CO2, CO3, CO4,	72	40	3	

	CO5				addressed
PO5					
PO6	CO1, CO2, CO3, CO4, CO5	12	6	1	
PO7					

CO-PO Mapping

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2	3	3		2		1	2	2
CO2	2	3	3	3		2		1	2	2
CO3	3	2	3	3		3		1	2	2
CO4	3	2	3	3		3		2	2	2
CO5	3	2	3	3		3		2	2	2
Average	2.6	2.2	3	3		2.6		1.4	2	2

Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz

(vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc

Key competencies to be achieved by the student

S.No	Major topic	Key Competency
1.	Importance of Engineering Drawing	• Explain the linkages between Engineering drawing and other subjects of study in Diploma course.
2.	Engineering Drawing Instruments	• Select the correct instruments to draw various entities in different orientation
3.	Free hand lettering & Numbering	• Write titles using sloping and vertical lettering and numerals as per B.I.S (Bureau of Indian standards)
4.	Dimensioning Practice	• Dimension a given drawing using standard notations and desired system of dimensioning

5.	Geometrical construction	• Construct ellipse, parabola, rectangular hyperbola, involute, cycloid and helix from the given data.
6.	Projection of points, Lines, Planes & Solids	• Draw the projections of points, straight lines, planes & solids with respect to reference planes (HP& VP)
7.	Auxiliary views	• Draw the auxiliary views of a given Engineering component • Differentiate between Auxiliary view and apparent view
8.	Sections of Solids	• Differentiate between true shape and apparent shape of section • Apply principles of hatching. • Draw simple sections of regular solids
9.	Orthographic Projection	• Draw the minimum number of views needed to represent a given object fully.
10.	Pictorial Drawings	• Differentiate between isometric scale and true scale. • Draw the isometric views of given objects,.
11.	Development of surfaces	• Prepare development of Surface of regular solids and other components like i) funnel ii) 90^0 elbow

COURSE CONTENT

NOTES:

1. **B.I.S Specification should invariably be followed in all the topics.**
2. **A-3 Size Drawing Sheets are to be used for all Drawing Practice Exercises.**

1.0 The importance of Engineering Drawing

Explanation of the scope and objectives of the subject of Engineering Drawing Its importance as a graphic communication -Need for preparing drawing as per standards – SP-46 –1988 – Mention B.I.S - Role of drawing in -engineering education – Link between Engineering drawing and other subjects of study.

2.0 Engineering drawing Instruments

Classifications: Basic Tools, tools for drawing straight lines, tools for curved lines, tools for measuring distances and special tools like mini drafter & drafting machine – Mentioning of names under each classification and their brief description -Scales: Recommended scales reduced & enlarged -Lines: Types of lines, selection of line thickness - Selection of Pencils -Sheet Sizes: A0, A1, A2, A3, A4, A5, Layout of drawing sheets in respect of A0, A1, A3 sizes, Sizes of the Title block and its contents - Care and maintenance of Drawing Sheet, Drawing plate: Lay out of sheet – as per SP-46-1988 to a suitable scale - Simple Exercises on the use of Drawing Instruments. Importance of Title Block.

3.0 Free hand lettering & numbering

Importance of lettering – Types of lettering -Guide Lines for Lettering - Practicing of letters &numbers of given sizes (7mm, 10mm and 14mm) -Advantages of single stroke or simple style of lettering - Use of lettering stencils

4.0 Dimensioning practice

Purpose of engineering Drawing, Need of B.I.S code in dimensioning -Shape description of an Engineering object -Definition of Dimensioning size description - Location of features, surface finish, fully dimensioned Drawing -Notations or tools of dimensioning, dimension line extension line, leader line, arrows, symbols, number and notes, rules to be observed in the use of above tools -Placing dimensions: Aligned system and unidirectional system (SP-46-1988)-Arrangement of dimensions Chain, parallel, combined progressive, and dimensioning by co-ordinate methods-The rules for dimensioning standard, features "Circles (holes) arcs, angles, tapers, chamfers, and dimension of narrow spaces.

5.0 Geometric Construction

Division of a line: to divide a straight line into given number of equal parts - Construction of tangent lines: to draw interior and exterior tangents to two circles of given radii and centre distance -Construction of tangent arcs: -i) To draw tangent arc of given radius to touch two lines inclined at given angle (acute, right and obtuse angles)-ii)Tangent arc of given radius touching a circle or an arc and a given line-iii)Tangent arcs of radius R, touching two given circles internally and externally - Construction of polygon: construction of any regular polygon by general method for given side length, inscribing circle radius and describing/super scribing circle radius - Conics: Explanation of Ellipse, Parabola, Hyperbola, as sections of a double cone and a loci of a moving point, Eccentricity of above curves – Their Eng. Applications viz., Projectiles, reflectors, P-V Diagram of a Hyperbolic process - Construction of any conic section of given eccentricity by general method -Construction of ellipse by concentric circles method, Oblong Method and Arcs of circles method -Construction of parabola by rectangle method and Tangent method -Construction of rectangular hyperbola - General Curves: Involute, Cycloid and Helix, explanations as locus of a moving point -their engineering application, viz., Gear tooth profile, screw threads, springs etc. –their construction

6.0 Projection of points, lines and planes & solids

Classification of projections, Observer, Object, Projectors, Projection, Reference Planes, Reference Line, Various angles of projections –Differences between first angle and third angle projections -Projections of points in different quadrants -Projections of straight line –(a)Parallel to both the planes (b)Perpendicular to one of the planes (c)Inclined to one plane and parallel to other planes - Projections of regular planes - (a) Plane parallel to one of the reference planes - (b) Plane perpendicular to HP and inclined to VP and vice versa - Projections of regular solids - (a) Axis perpendicular to one of the planes (b)Axis parallel to VP and inclined to HP and vice versa.

7.0 Auxiliary views

Need for drawing auxiliary views -Explanation of the basic principles of drawing an auxiliary views explanation of reference plane and auxiliary plane -Partial auxiliary view.

8.0 Sections of Solids

Need for drawing sectional views – what is a sectional view - Hatching – Section of regular solids inclined to one plane and parallel to other plane

9.0 Orthographic Projections

Meaning of orthographic projection -Using a viewing box and a model – Number of views obtained on the six faces of the box, - Legible sketches of only 3 views for describing object -Concept of front view, top view, and side view sketching these views for a number of engg objects - Explanation of first angle projection. – Positioning of three views in First angle projection - Projection of points as a means of locating the corners of the surfaces of an object – Use of miter line in drawing a third view when other two views are given -Method of representing hidden lines - Selection of minimum number of views to describe an object fully.

10.0 Pictorial Drawings

Brief description of different types of pictorial drawing viz., Isometric, oblique, and Perspective and their use - Isometric drawings: Iso axis, angle between them, meaning of visual distortion in dimensions - Need for an isometric scale, difference between Isometric scale, and ordinary scale difference between Isometric view and Isometric projection - Isometric and non-Isometric lines -Isometric drawing of common features like rectangles, circular - shapes, non-isometric lines - Use of box and offset methods.

11.0 Development of Surfaces

Need for preparing development of surface with reference to sheet metal work-Concept of true length of a line with reference to its orthographic projection when the line is (i) parallel to the plane of projection (ii) inclined to one principal and parallel to the other -Development of simple solids like cubes, prisms, cylinders, cones, pyramid and truncation of these solids-Types of development: Parallel line and radial line development -Procedure of drawing development of funnels, 90^0 elbow pipes.

REFERENCE BOOKS:

1. Engineering Drawing,N.D.Bhatt, Charotar Publications
   :
2. Engineering Graphics ,P I Varghese, McGraw-hill
3. Engineering Drawing,Basant Agarwal & C.M Agarwal,McGraw-hill
4. SP-46-1998, Bureau of Indian Standards.

SURVEYING-I PRACTICE & PLOTTING

Course Code	Course Title	No. of Periods per Week	Total No. of Periods	Marks for Formative Assessment	Marks for Summative Assessment
C-108	SURVEYING-I PRACTICE & PLOTTING	04	120	40 (30 for class exercises + 10 for Survey camp)	60

S. No.	Major Topics	No. of Periods	COs MAPPED
1.	Chain surveying	28	CO1
2.	Compass Surveying	28	CO2
3.	Levelling	40	CO3
4.	Plotting	24	CO1,CO2,CO3
	Total	**120**	
5	A Survey camp, immediately after completion of all exercises, shall be conducted for 3 days during 8 AM to 12 noon & 2PM to 4 PM on each day followed by one day break and 2 days of plotting from 9AM to 5 PM, with one hour lunch break. (25% of total sessional marks shall be allocated to this activity. The skills learnt during class exercises shall be demonstrated in a simulated field like situation and shall be assessed appropriately)	6 days (Additional instructional duration & NOT to be included in the above 180 periods)	CO1,CO2,CO3

COURSE OBJECTIVES:

Course Objectives	(i)	Enhance knowledge about surveying instruments & methods adopted to carry out Field Survey with a professional approach.
	(ii)	Develop skills in using chain, tape, compass& Dumpy level

COURSE OUTCOMES:

Course Outcomes	CO1	C-108.1	Apply standard Practices to perform chain survey in the field and to plot from field data
	CO2	C-108.2	Apply Principles to Perform compass survey and plot from field data
	CO3	C-108.3	Conduct experiments on methods of levelling, Longitudinal and cross sectioning for the given alignment and analyse the data by Block levelling (contours) prepare the drawings.

Learning Outcomes	**1.0 Chain surveying** 1.1. Practice unfolding and folding a chain. 1.2. Perform direct ranging on level ground and measure the distance between two given stations and record the measurements in the field book. 1.3. Perform indirect ranging and measure the distance between two given stations when a high ground intervenes to prevent indivisibility of ends of line. 1.4. Set out a right angle to a given chain line by using chain only. 1.5. Set and measure offsets for a given chain line by 1.Perpendicular offsets and 2.Oblique offsets. 1.6. Perform triangulation survey of a given area with chain and cross staff and record all necessary details. 1.7. Calculate the area bounded by the given points by chain triangulation and compare the result with the area calculated from plotting. 1.8. Calculate the area bounded by the given points by chain and Cross staff compares the result with the area calculated from plotting. 1.9. Carry out chain survey to overcome obstacles like pond, building etc and plot the Survey from field book measurements. 1.10. Carry out chain traversing to survey an area bounded by more than three stations and plot the Survey from field book measurements. **2.0 Compass Survey** 2.1 Identify the parts of a prismatic Compass 2.2 Set up the compass at a station and carry out temporary adjustments. 2.3 Take bearings of two points from instrument station and calculate the included angle. 2.4 Perform an open traverse with Compass and Chain. 2.5 Perform a closed traverse with compass and chain.

	3.0 Levelling 3.1 Identify the component parts of a dumpy level / Auto level and Study different types of levelling staves 3.2 Perform temporary adjustments of a dumpy level / Auto level for taking observations and Practice taking staff readings and recording them in level field book. 3.3 Take staff readings for differential levelling and Compute the difference in elevation between two stations (take invert levels also) 3.4 Conduct profile levelling along a route and compute the RLs at various stations 3.5 Conduct profile levelling by taking cross sections across a route and compute the RLs at various stations 3.6 Conduct profile levelling along a route by taking readings along both LS and CS and compute the RLs 3.7 Conduct block levelling for the given area 3.8 Locate the contour Points by Radial method in the field **4.0 PLOTTING** 4.1 Understand the importance and relation between field work and plotting.

PO-CO Mapping:

Course Code: C-108	**Course Title: SURVEYING –II Practice&Plotting No. of COs: 3**				**No. of Periods: 180**
POs	**Mapped with CO Nos.**	**CO periods addressing PO in Col.1**		**Level (1,2,3)**	**Remarks**
		No.	**%**		
1	1,2,3	47	26	2	>40% Level.3 (Highly addressed) 25% - 40% Level.2 (Moderately addressed
2	1,2,3	27	15	1	
3					
4	1,2,3	76	42	3	

5	1,2,3	10	6	1	5% - 25% Level.1 (Low addressed)
6	1,2,3	10	6	1	<5% Not addressed
7	1,2,3	10	5	1	

CO-PO Mapping:

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2		2	2	2	2	2	2	2
CO2	2	3		2	2	2	2	2	2	2
CO3	3	2		3	3	3	2	2	2	2
Average	**2.3**	**2.3**		**2.3**	**2.3**	**2.3**	**2**	**2**	**2**	**2**

Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz

(vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc

COURSE CONTENT

1.0 Chain Surveying

a) Practice unfolding and folding of a chain.
b) Ranging and chaining of lines on level ground and recording in field book to measure the distance between two stations.
c) Chaining a line involving indirect ranging.
d) Setting and measuring the offsets-Perpendicular and Oblique offsets
e) Measurement of land areas –cross staff survey
f) Chain triangulation around the building covering a small area with other details taking offsets and recording.
g) Chain triangulation involving a road with other details taking offsets and recording.
h) Chain traversing to survey an area bounded by more than three stations.

2.0 Compass Surveying

a) Setting up the compass – observations of bearings
b) Calculation of included angles from the observed bearings
c) Traversing with prismatic compass and chain – open Traverse – Recording.
d) Traversing with prismatic compass and chain- closed traverse - recording.

3.0 Levelling

a) Study of dumpy level, levelling staves – performing Temporary adjustments of level.
b) Taking staff readings of various stations – booking of readings in level field book.
c) Differential and Fly levelling – calculation of reducing levels by height of collimation and Rise & Fall methods (inverted levels also)
d) Profile levelling along a route by taking readings along both LS and CS and compute the RLs
e) Contouring – block levelling and locating contour points by Radial method

4.0 Plotting

a) Conventional signs in Surveying 2 Exercises
b) Plotting of perpendicular offsets1 Exercise

c) Plotting of land surveys – Chain 3 Exercises
and cross-staff Surveying – Calculation of areas
d) Plotting of chain triangulation 2 Exercises
Surveying of small areas around Buildings.
e) Chain traversing to survey an area bounded by 2 Exercises
more than three stations
f) Plotting of open traverse by Compass
surveying and locating details 2 Exercises.
g) Compass survey by method of radiation- 1 Exercise
calculation of area
h) Plotting of LS and CS 2 Exercises
i) Plotting of contours by Block levelling 2 Exercises

Total 16 Exercises

KEY competencies to be achieved by the student

S.NO.	Experiment Title	Key Competency
1	Field Exercises in Chain Surveying Ex 1.1 Ex 1.2	• Practice unfolding and folding a chain. • Perform direct ranging on level ground and measure the distance between two given stations and record the measurements in the

	Ex 1.3 Ex 1.4 Ex 1.5 Ex 1.6 Ex.1.7 Ex.1.8 Ex 1.9 Ex 1.10	field book. • Perform indirect ranging and measure the distance between two given stations when a high ground intervenes to prevent inter visibility of ends of line. • Set out a right angle to a given chain line by using chain only. • Set and measure offsets for a given chain line by 1. Perpendicular offsets and 2.Oblique offsets. • Perform triangulation survey of a given area with chain and cross staff and record all necessary details. • Calculate the area bounded by the given points by chain triangulation and compare the result with the area calculated from plotting. • Calculate the area bounded by the given points by chain and Cross staff compare the result with the area calculated from plotting. • Carry out chain survey to overcome obstacles like pond, building etc and plot the Survey from field book measurements. • Carry out chain traversing to survey an area bounded by more than three stations and plot the Survey from field book measurements.
2	Field Exercises in Compass Surveying Ex 1.1 Ex 1.2 Ex 1.3	• Identify the parts of a prismatic Compass • Set up the compass at a station and carry out temporary adjustments. • Take bearings of two points from instrument station and calculate the included angle.

	Ex 1.4 Ex 1.5	• Perform an open traverse with Compass and Chain. • Perform a closed traverse with compass and chain.
4	Field Exercises in Levelling Ex 1.1 Ex 1.2 Ex 1.3 Ex 1.4 Ex 1.5 Ex 1.6 Ex.1.7 Ex.1.8	• Identify the component parts of a dumpy level / Auto level and Study different types of levelling staves • Perform temporary adjustments of a dumpy level / Auto level for taking observations and Practice taking staff readings and recording them in level field book • Take staff readings for differential levelling and Compute the difference in elevation between two stations (take invert levels also) • Conduct profile levelling along a route and compute the RLs at various stations • Conduct profile levelling by taking cross sections across a route and compute the RLs at various stations • Conduct profile levelling along a route by taking readings along both LS and CS and compute the RLs • Conduct block levelling for the given area • Locate the contour Points by Radialmethod in the field

ENGINEERING PHYSICS LAB

SUBJECT	SUBJECT CODE	TOTAL PERIODS	NUMBER OF PERIODS PER WEEK
PHYSICS LAB	C -109	45	03

Course objectives	(1) To provide strong practical knowledge of Physics to serve as a tool for various device applications in Engineering. (2) To enhance scientific skills of the students by incorporating new experiments so as to enrich the technical expertise of the students as required for industries.

COURSE OUTCOMES	CO1	Improving accuracy in various measurements; understanding the nature of the forces keeping the body in equilibrium.
	CO2	Estimating the acceleration caused by the gravity of earth; Practical study of the concepts of refraction of light at curved/plane surface
	CO3	Understanding the pressure of the gas as function of its volume; study of the combined magnetic field of the earth and an artificial magnet to estimate its pole strength; Estimating the velocity of sound in air through resonance phenomenon.
	CO4	Applying Kirch off's laws to evaluate the specific resistance of a wire; Study of exchange of heat from system to surrounding by graphical analysis; Conversion of light energy to micro currents as potential engineering application.

CO-PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2	2	2	1	2
CO2	3		1	1	1	1	1
CO3	3	2			1		
CO4	3	2	2			1	2

CO-PO Mapping Strength

C -109	Engineering Physics No of Course Objectives : 4				No of periods 45
POs	Mapped with CO No	CO periods addressing PO in Col 1 NO	%	Level 1,2,3	remarks
PO1	CO1,CO2,CO3,CO4	15	33.3 %	2	>40% level 3 (highly addressed) 25% to 40% level 2 (moderately addressed) 5% to 25% level 1 (Low addressed) < 5% (not addressed)
PO2	CO1,CO3, CO4	8	17.8%	1	
PO3	CO1, CO2, CO4	6	13.3%	1	
PO4	CO1, CO2	3	6.7%	1	
PO5	CO1,CO2, CO3	5	11.1%	1	
PO6	CO1, CO2, CO4	3	6.7%	1	
PO7	CO1, CO2, CO4	5	11.1%	1	

3 = strongly mapped, 2 = moderately mapped, 1 = slightly mapped

Note: The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following.

(i) Seminars (ii) Viva-voce (iii) Assignments
(iv) Quiz competitions (v) Industrial visits (vi) Tech fest
(vii) Mini project
(viii) Group discussions (ix) Virtual labs (x) Library visit for e-books

ENGINEERING PHYSICS LAB

TIMESCHEDULE

S.No	List of experiments	No.of Periods
1.	Vernier callipers	03
2.	Micrometre (Screw gauge)	03
3.	Verification of Lami's theorem using concurrent forces	03
4.	Determination of 'g' using simple pendulum	03
5.	Focal length and focal power of convex lens	03
6.	Refractive index of solid using travelling microscope	03
7.	Verification of Boyle's law using Quill tube	03
8	Determination of pole strength of the bar magnet through magnetic field lines	03
9	Resonance apparatus – Determination of velocity of sound in air	03
	Experiments for demonstration	
10	Meter bridge – Determination of resistance and specific resistance of a wire	03
11	Verification of Newton's law of cooling	03
12	Photo electric cell – Study of its characteristics	03
	Revision	06
	Test	03
	Total:	**45**

Learning Outcomes

Upon completion of the course the student shall be able to

1.0 Practice with Vernier callipers to determine the volumes of cylinder and sphere.
2.0 Practice with Screw gauge to determine thickness of a glass plate and cross sectional area of a wire.
3.0 Verify the Lami's theorem using concurrent forces.
4.0 Determine the value of acceleration due to gravity (g) using Simple Pendulum. To

verify the result from $l\text{-}T^2$ graph.

5.0 Calculate the Focal length and focal power of convex lens using distant object method and U-V method. To verify the result from U-V graph and 1 / U – 1 / V graph methods.

6.0 Determine the refractive index of a solid using travelling microscope

7.0 Verify the Boyle's law using Quill tube. To draw a graph between P and 1/l.

8.0 Determination of magnetic pole strength of a bar magnet by drawing magnetic lines of force and locating null points (either N - N or N - S method)

9.0 Determine the velocity of sound in air at room temperature and its value at zero degree Centigrade using resonance apparatus.

10.0 Determine the resistance and specific resistance of material of a wire using Meter Bridge

11.0 To verify the Newton's law of cooling.

12..0 To study the characteristics of photo electric cell.

Course Outcomes

S.No	List of experiments	No.of Periods	COs
1.	Vernier calipers	03	CO1
2.	Micrometer (Screw gauge)	03	
3.	Verification of Lami's theorem using concurrent forces	03	
4.	Determination of g using simple pendulum	03	CO2
5.	Focal length and power of convex lens	03	
6.	Refractive index of solid using travelling microscope	03	
7.	Verification of Boyle's law using Quill tube	03	CO3
8	Determination of pole strength of the bar magnet through magnetic field lines	03	
9	Resonance apparatus – Determination of velocity of sound in air	03	
10	Meter bridge – Determination of resistance and specific resistance of a wire	03	CO4
11	Verification of Newton's law of cooling	03	
12	Photo electric cell – Study of its characteristics	03	

Competencies and Key competencies to be achieved by the student

Name of the Experiment (Nu	Competencies	Key competencies
1 . Practice on Vernier Calipers (03)	• Find the Least count • Fix the specimen in position • Read the scales • Calculate the physical quantities of given object	• Read the scales • Calculate the requisite physical quantities of given objects • Calculating volumes of the cylinder and sphere
2. Practice on Screw gauge(03)	• Find the Least count • Fix the specimen in position • Read the scales • Calculate thickness of glass plate and cross section of wire from radius	• Read the scales • Noting zero error • Calculate thickness of given glass plate • Calculate cross section of wire from radius
3. Verification of Lami's theorem forces(03)	• Making experimental set up • Fix suitable weights • Note the positions of threads on drawing sheet • Find the angles between the concurrent forces • Changing weights appropriately • Verify Lami's theorem	•Measuring angles between the forces • Marking the directions of forces on a paper • Verifying Lami's theorem from the weights and measured angles between the forces.
4. Simple pendulum(03)	• Fix the simple pendulum to the stand • Adjust the length of pendulum • Find the time for number of oscillations (say 20) • Find the time period • Calculate the acceleration due to gravity	• Find the time for number of oscillations • Find the time period • Calculate the acceleration due to gravity • Verify form l-T^2 graph
5. Focal length and Focal power of convex lens (03)	• Fix the object distance • Find the Image distance • Calculate the focal length and power of convex lens • Draw u-v and 1/u – 1/v graphs	• Find focal length from distant object method. • Calculate the focal length and power of convex lens • Verify result from u-v and 1/u – 1/v graphs

6 Refractive index of solid using traveling microscope(03)	• Find the least count of Vernier on microscope • Place the graph paper below microscope • Read the scales	• Reading the scales on Microscope. • Fiding real and apparent thickness of the slab • Calculate the refractive
7 . Boyle's law verification (03)	• Note the atmospheric pressure • Fix the Quill tube to retort stand • Find the length of air column • Find the pressure of enclosed air • Find and compare the calculated values of P x l	• Fixing Quill tube in various positions on retort stand. • Find the length of air column • Find the pressure of enclosed air • Find the values of Px l • Verify Boyle's law.
8. Mapping of magnet lines of force (03)	• Draw magnetic meridian • Place the bar magnet in N-N or N-S directions • Draw magnetic lines of force • Locate the neutral points	• Draw the pattern of magnetic lines of force • Locate the neutral points • Calculating pole strength of the bar magnet
9. Velocity of sound in air – Resonance method (03)	• Arrange the resonance apparatus • Adjust the reservoir level for booming sound • Find the first and second resonanting lengths • Calculate velocity of sound	• Adjust the reservoir level • Find the first and second resonanting lengths • Calculate velocity of sound at room temperature and at 0^0 C
10. Meter bridge(03)	• Make the circuit connections • Find the balancing length • Calculate unknown resistance • Find the radius of wire • Calculate the specific resistance	• Making connections as per circuit diagram. • Find the balancing length • Calculate unknown resistance • Calculate the specific resistance of the given

11. Verification of Newton's law of Cooling (03)	• Heating liquid in a beaker using a heating element • Inserting thermometer in liquid in calorimeter • Stirring liquid • Measuring temperatures as a function of time using thermometer • Plotting a cooling curve	• Measuring temperature of a liquid as function of time. • Plotting a cooling curve. • Verifying Newton's law of cooling.
12. Photo electric cell – Study of its Characteristics (03)	• Experimental set up and making connections • Veryfying intensity of light by varying distances between light source and photocell. • Measuring Voltage and current values.	• Making connections for experimental set up. • Varying distances appropriately • Measuring Voltage and current values. • Study of V- I Characteristics

Scheme of Valuation for End Practical Examination:

Activity	Marks
For writing, Apparatus, formulae, least count (if applicable)	5
Procedure & precautions	5
Drawing Tables	3
Readings, calculations, graph (if applicable), reporting the findings	12
Viva-voce	5
Total marks	**30**

CHEMISTRY LABORATORY

(C-23 curriculum common to all Branches)

SUBJECT	SUBJECT CODE	TOTAL PERIODS	NUMBER OF PERIODS PER WEEK
CHEMISTRY LABORATORY	C -110	45	03

COURSE OUTCOMES	**CO1**	Operate and practice volumetric apparatus and preparation of standard solution.
	CO2	Evaluate and judge the neutralization point in acid base titration.
	CO3	Evaluate the end point of reduction and oxidation reaction.
	CO4	Judge the stable end point of complex formation, stable precipitation.
	CO5	Judge operate and demonstrate and perform precise operations with instrument for investigation of water pollution parameters.

PO- CO mapping

Course code Common-110	**Chemistry Laboratory No. of CO's:5**				**No. of periods : 45**
POs	Mapped with CO No.	CO periods addressing PO in Col. No. 1	%	Level 1,2,3	Remarks
PO1	CO1,CO2,CO3, CO4,CO5	12	26.66	2	>40% Level 3 (highly addressed) 25% to 40% Level 2 (moderately addressed) 5% to 25% Level1 (Low addressed) < 5%(not addressed)
PO2	CO1,CO2,CO3, CO4,CO5	9	20	1	
PO3					
PO4	CO1,CO2,CO3, CO4,CO5	12	26.66	2	
PO5	CO2,CO3, CO4,CO5	12	26.66	2	
PO6					
PO7					

COs-POs mapping strength (as per given table)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	1	-	2	-	-	-	-	-	-
CO2	2	1	-	2	2	-	-	-	-	-
CO3	2	1	-	2	2	-	-	-	-	-
CO4	2	1	-	2	2	-	-	-	-	-
CO5	2	1	-	2	2	-	-	-	-	-

3=strongly mapped 2= moderately mapped 1= slightly mapped

Note: The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following: i) Seminars ii) Tutorials iii) Guest Lectures iv) Assignments v) Quiz competitions vi) Industrial visit vii) Tech Fest viii) Mini project ix) Group discussions x) Virtual classes xi) Library visit for e-books

TIME SCHEDULE

S.No	Name of the Experiment	No. of Periods	Mapped with COs
1.	a) Recognition of chemical substances and solutions used in the laboratory by senses. b) Familiarization of methods for Volumetric analysis.	03	CO1
2.	Preparation of Std.Na_2CO_3solution and making solutions of different	03	CO1
3.	Estimation of HCl solution using Std.Na_2CO_3solution.	03	CO2
4.	Estimation of NaOH using Std. HCl solution.	03	CO2
5.	Determination of acidity of water sample.	03	CO2
6.	Determination of alkalinity of water sample.	03	CO2
7.	Estimation of Mohr's Salt usingStd.$KMnO_4$. Solution.	03	CO3
8.	Estimation of Ferrous ion by using Std. $K_2Cr_2O_7$ solution.	03	CO3
9.	Determination of total hardness of water sample using Std. EDTA solution.	03	CO4
10.	Estimation of Chlorides present in water sample by using Std. $AgNO_3$ solution	03	CO4
11.	Estimation of Dissolved Oxygen(D.O) in water sample by using Std. hypo solution	03	CO5
12.	Determination of pH using pH meter..	03	CO5
13.	Determination of conductivity of water and adjusting ionic strength	03	CO5
14.	Determination of turbidity of water.	03	CO5
15.	Estimation of total solids present in water sample.	03	CO5
	Total:	**45**	

Objectives:

Upon completion of the course the student shall be able to

1.0 To identify the chemical compounds and solutions by senses.
Practice volumetric measurements (using pipettes, measuring jars, volumetric flask, burettes)
and gravimetric measurements (using different types of balances), making dilutions, etc.
2.0 Practice making standard solutions with pre weighed salts and to make solutions of desired dilutions using appropriate techniques.
3.0 Conduct titrations adopting standard procedures and using Std. Na_2CO_3 solution for estimation of HCl.
4.0 Conduct titrations adopting standard procedures and using Std. HCl solution for estimation of NaOH.
5.0 Conduct titrations adopting standard procedures to determine the acidity of given samples of water (One ground water and one surface / tap water, and rain water if available).
6.0 Conduct titrations adopting standard procedures to determine the alkalinity of given samples of water (One ground water and one surface / tap water).
7.0 Conduct titrations adopting standard procedures and using Std.$KMnO_4$ solution for estimation of Mohr'sSalt.
8.0 Conduct titrations adopting standard procedures and using Std.$K_2Cr_2O_7$ solution for estimation of Ferrous ion.
9.0 Conduct titrations adopting standard procedures to determine the total hardness of given samples of water (One ground water and one surface / tap water) using Std. EDTA solution.
10. Conduct titrations adopting standard procedures to determine the chlorides present in the given samples of water (One ground water and one surface / tap water) using Std. $AgNO_3$ solution.
11. Conduct the test using titrimetric / electrometric method to determine. Dissolved Oxygen (D.O) in the given water samples (One sample from closed container and one from open container / tap water) by Std. Hypo solution.
12. Conduct the test on given samples of water / solutions (like soft drinks, sewage, etc.) to determine their pH using standard pH meter.
13. Conduct the test on given samples of water / solutions.
    a) to determine conductivity.
    b) to adjust the ionic strength of the sample to the desired value.
14. Conduct the test on given samples of solutions (coloured and non-coloured) to determine their turbidity in NTU.
15. Determine the total solids present in given samples of water (One ground water and one surface / tap water).

Competencies and Key competencies to be achieved by the student

Name of the Experiment (No of Periods)	Competencies	Key competencies
Recognition of chemical substances and solutions. Familiarization of methods for Volumetric analysis. (03)	-	--
Preparation of Std.Na_2CO_3 solution and making solutions of different dilutions. (03)	▪ Weighing the salt to the accuracy of .01 mg. ▪ Measuring the water with volumetric flask, measuring jar, volumetric pipette and graduated pipette. ▪ Making appropriate dilutions.	▪ Weighing the salt to the accuracy of 0.01 mg. ▪ Measuring the water with volumetric flask, measuring jar, volumetric pipette and graduated pipette. ▪ Making appropriate
Estimation of HCl solution using Std. Na_2CO_3 solution. (03)	▪ Cleaning the glassware and rinsing with appropriate solutions. ▪ Making standard solutions. ▪ Measuring accurately the standard solutions and titrants. ▪ Filling the burette with titrant. ▪ Fixing the burette to the stand. ▪ Effectively Controlling the flow of the titrant. ▪ Identifying the end point. ▪ Making accurate observations. ▪ Calculating the results.	▪ Making standard solutions. ▪ Measuring accurately the standard solutions and titrants. ▪ Effectively Controlling the flow of the titrant. ▪ Identifying the end point. ▪ Making accurate observations.
Estimation of NaOH using Std. HCl solution. (03)		
Determination of acidity of water sample. (03)		
Determination of alkalinity of water sample. (03)		
Estimation of Mohr's Salt using Std.$KMnO_4$ solution. (03)		
Estimation of Ferrous ion by using Std.$K_2Cr_2O_7$ solution (03)		
Determination of total hardness of water using Std. EDTA solution. (03)		
Estimation of Chlorides present in water sample using Std. $AgNO_3$ solution (03)		
Estimation of Dissolved Oxygen(D.O) in water sample (By titration method) (03)		
Determination of pH using pH meter. (03)	▪ Familiarize with instrument.	▪ Prepare standard solutions / buffers,

Determination of conductivity of water and adjusting ionic strength to required Determination of turbidity of water. (03)	▪ Choose appropriate 'Mode' / 'Unit'. ▪ Prepare standard solutions / buffers, etc. ▪ Standardize the instrument with appropriate standard solutions. ▪ Plot the standard curve. ▪ Make measurements	etc. ▪ Standardize the instrument with appropriate standard solutions. ▪ Plot the standard curve. ▪ Make measurements accurately.
Estimation of total solids present in water sample. (03)	▪ Measuring the accurate volume and weight of sample. ▪ Filtering and air drying without losing any filtrate. ▪ Accurately weighing the filter paper, crucible and	▪ Measuring the accurate volume and weight of sample. ▪ Filtering and air drying without losing any filtrate. ▪ Accurately weighing the filter paper.

SCHEME OF VALUATION

A) Writing Chemicals, apparatus, principle and procedure. 5M

B) Demonstrated competencies. 20M
Making standard solutions.
Measuring accurately the standard solutions and titrants.
Effectively controlling the flow of the titrant.
Identifying the end point.
Making accurate observations.

C) Viva-voce. 5M

Total **30M**

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COMPUTER FUNDAMENTALS LAB

Course code	Course Title	No. of Periods/Weeks	Total No. of periods	Marks for FA	Marks for SA
C-111 (common to all branches)	Computer Fundamentals Lab	3	90	40	60

Time schedule:

S.No.	Chapter/Unit Title	No. of sessions each of 3 periods duration	No.of Periods
1.	Computer hardware Basics	2	6
2.	Windows Operating System	2	6
3.	MS Word	8	24
4.	MS Excel	7	21
5.	MS PowerPoint	5	15
6.	Adobe Photoshop	6	18
	Total periods	**30**	**90**

S.No.	Chapter/Unit Title	No.of Periods	CO's Mapped
1.	Computer hardware Basics	6	CO1
2.	Windows Operating System	6	CO1
3.	MS Word	24	CO2
4.	MS Excel	21	CO3
5.	MS PowerPoint	15	CO4
6	Adobe Photoshop	18	CO5
	Total periods	**90**	

Course Objectives	i)To know Hardware Basics ii)To familiarize operating systems iii)To use MS Office effectively to enable to students use these skills in future courses iv) To use Adobe Photoshop in image editing.

Course Outcomes	At the end of the course students will be able to		
	CO1	C-111.1	Identify hardware and software components
	CO2	C-111.2	Prepare documents with given specifications using word processing software
	CO3	C-111.3	Use Spread sheet software to make calculation and to draw various graphs / charts.
	CO4	C-111.4	Use Power point software to develop effective presentation for a given theme or topic.
	CO5	C-111.5	Edit digital or scanned images using Photoshop

CO-PO/PSO MATRIX

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
C-111.1	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
C-111.2	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
C-111.3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
C-111.4	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
C-111.5	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
Average	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**

3=Strongly mapped, 2=moderately mapped, 1=slightly mapped

Learning Outcomes:

I. Computer Hardware Basics

1. a).To Familiarize with Computer system and hardware connections
   b).To Start and Shut down Computer correctly
   c).To check the software details of the computer
2. To check the hardware present in your computer

II. Windows's operating system

3. To Explore Windows Desktop
4. Working with Files and Folders
5. Windows Accessories: Calculator – Notepad – WordPad – MS Paint

III. Practice with MS-WORD

6. To familiarize with Ribbon layout of MS Word
   Home – Insert- Page layout – References – Review- View.
7. To practice Word Processing Basics
8. To practice Formatting techniques
9. To insert a table of required number of rows and columns
10. To insert Objects, Clipart and Hyperlinks
11. To use Mail Merge feature of MS Word
12. To use Equations and symbols features

IV. Practice with MS-EXCEL

13. To familiarize with MS-EXCEL layout

14. To access and enter data in the cells
15. To edit a spread sheet- Copy, Cut, Paste, and selecting Cells
16. To use built in functions and Formatting Data
17. To create Excel Functions, Filling Cells
18. To enter a Formula for automatic calculations
19. To sort and filter data in table.
20. To present data using Excel Graphs and Charts.
21. To develop lab reports of respective discipline.
22. To format a Worksheet in Excel, Page Setup and Print

V. Practice with MS-POWERPOINT

23. To familiarize with Ribbon layout features of PowerPoint 2007.
24. To create a simple PowerPoint Presentation
25. To set up a Master Slide in PowerPoint
26. To insert Text and Objects
27. To insert a Flow Charts
28. To insert a Table

29. To insert a Charts/Graphs
30. To insert video and audio
31. To practice Animating text and objects
32. To Review presentation

VI. Practice with Adobe Photoshop

33.To familiarize with standard toolbox
34. To edit a photograph.
35. To insert Borders around photograph.
36. To change Background of a Photograph.
37. To change colors of Photograph.
38. To prepare a cover page for the book in your subject area.
39. To adjust the brightness and contrast of the picture so that it gives an elegant look.
40. To type a word and apply the shadow emboss effects.

Key competencies:

Expt No	Name of Experiment	Competencies	Key competencies
1 (a).	To familiarize with Computer system and hardware connections	**a.** Identify the parts of a Computer system: i). CPU ii). Mother Board iii) Monitor iv) CD/DVD Drive v) Power Switch vi) Start Button vii) Reset Button b. Identify and connect various peripherals c. Identify and connect the cables used with computer system d. Identify various ports on CPU and connect Keyboard & Mouse	Connect cables to external hardware and operate the computer
1 (b).	To Start and Shut down	a. Log in using the password	a. Login and logout as per the standard

	Computer correctly	b. Start and shut down the computer c. Use Mouse and Key Board	procedure b. Operate mouse &Key Board
1 (c).	To Explore Windows Desktop	a. Familiarize with Start Menu, Taskbar, Icons and Shortcuts b. Access application programs using Start menu, Task manager c. Use Help support	a. Access application programs using Start menu b. Use taskbar and Task manager
2.	To check the software details of the computer	a. Find the details of Operating System being used b.Find the details of Service Pack installed	Access the properties of computer and find the details
3.	To check the hardware present in your computer	a.Find the CPU name and clock speed b.Find the details of RAM and Hard disk present c. Access Device manager using Control Panel and check the status of devices like mouse and key board d. Use My Computer to check the details of Hard	a. Access device manager and find the details b. Type /Navigate the correct path and Select icon related to the details required

		drives and partitions e. Use the Taskbar	
4.	Working with Files and Folders	a. Create folders and organizing files in different folders b. Use copy / paste move commands to organize files and folders	a. Create files and folders Rename , arrange and search for the required folder/file
	Working with Files and Folders Continued....	c. Arrange icons – name wise, size, type, Modified d. Search a file or folder and find its path e. Create shortcut to files and folders (in other folders) on Desktop f. Familiarize with the use of My Documents g. Familiarize with the use of Recycle Bin	b. Restore deleted files from Recycle bin
5.	To use Windows Accessories: Calculator – Notepad – WordPad – MS Paint	a. Familiarize with the use of Calculator b. Access Calculator using Run command c. Create Text Files using Notepad and WordPad and observe the difference in file size d. Use MS paint and create .jpeg, .bmp files	a. Use windows accessories and select correct text editor based on the situation. b. Use MS pain to create /Edit pictures and save in the required

		using MS Paint	format.
6.	To familiarize with Ribbon layout of MS word. – Home – Insert- page layout- References- Review-View	a. Create/Open a document b. Use Save and Save as features c. Work on two Word documents simultaneously d. Choose correct Paper size and Printing options	a. Create a Document and name appropriately and save b. Set paper size and print options
7.	To practice Word Processing Basics	a. Typing text b. Keyboard usage c. Use mouse (Left click / Right click / Scroll) d. Use Keyboard shortcuts e. Use Find and Replace features in MS- word f. Use Undo and Redo Features g. Use spell check to correct Spellings and Grammar	a. Use key board and mouse to enter/edit text in the document. b. Use shortcuts c. Use spell check/ Grammar features for auto corrections.
8.	To practice Formatting techniques	a. Formatting Text b. Formatting Paragraphs c. Setting Tabs d. Formatting Pages e. The Styles of Word	a. Format Text and paragraphs and use various text styles. b. Use bullets and numbers to create lists c. Use Templates

		f. Insert bullets and numbers g. Themes and Templates h. Insert page numbers, header and footer	/Themes d. Insert page numbers date, headers and footers
9.	To insert a table of required number of rows and columns	a. Edit the table by adding the fields – Deleting rows and columns –inserting sub table –marking borders. Merging and splitting of cells in a Table b. Changing the background colour of the table c. Use table design tools d. Use auto fit – fixed row/ column height/length – Even distribution of rows / columns features e. Convert Text to table and Table to Text f. Use Sort feature of the Table to arrange data in ascending/descending order	a. Insert table in the word document and edit b. Use sort option for arranging data.
10.	To Insert objects, clipart and Hyperlinks	a. Create a 2-page document. &Insert hyperlinks and t Bookmarks. b. Create an organization chart c. Practice examples like preparing an Examination schedule notice with a	a. Insert hyperlinks &Bookmarks b. Create organization charts/flow charts

		hyperlink to Exam schedule table.	
11.	To Use Mail merge feature of MS Word	a. Use mail merge to prepare individually addressed letters b. Use mail merge to print envelopes.	Use Mail merge feature
12.	To use Equations and symbols features.	a. Explore various symbols available in MS Word b. Insert a symbol in the text c. Insert mathematical equations in the document	Enter Mathematical symbols and Equations in the word document
13.	To Practice with MS-EXCEL	a. Open /create an MS Excel spreadsheet and familiarize with MS Excel 2007 layout like MS office Button- b. Use Quick Access Toolbar-Title Bar- Ribbon-Worksheets- Formula Bar-Status Bar	a. Familiarize with excel layout and use b. Use various features available in toolbar
14.	To access and Enter data in the cells	a. Move Around a Worksheets-Quick access - Select Cells b. Enter Data-Edit a Cell-Wrap Text-Delete a Cell Entry-Save a File-Close Excel	a. Access and select the required cells by various addressing methods b. Enter data and edit
15.	To edit spread sheet Copy, Cut, Paste, and	a. Insert and Delete Columns and Rows-Create Borders-	Format the excel sheet

	selecting cells	Merge and Center b. Add Background Color- Change the Font, Font Size, and Font Color c. Format text with Bold, Italicize, and Underline- Work with Long Text- Change a Column's Width	
16.	To use built in functions and Formatting Data	a. Perform Mathematical Calculations verify - AutoSum b. Perform Automatic Calculations-Align Cell Entries	Use built in functions in Excel
17.	To enter a Formula for automatic calculations	a. Enter formula b. Use Cell References in Formulae c. Use Automatic updating function of Excel Formulae d. Use Mathematical Operators in Formulae e. Use Excel Error Message and Help	Enter formula for automatic calculations
18.	To Create Excel Functions, Filling Cells	a. Use Reference Operators b. Work with sum, Sum if , Count and Count If Functions c. Fill Cells Automatically	a. Create Excel sheets involving cross references and equations b. Use the advanced functions for conditional calculations
19.	To sort and filter data in	a. Sort data in multiple	a. Refine the data in a worksheet and

	table	columns b. Sort data in a row c. Sort data using Custom order d. Filter data in work sheet	keep it organized b. Narrow a worksheet by selecting specific choice
20.	To Practice Excel Graphs and Charts	a. Produce an Excel Pie Chart b. Produce c. Excel Column Chart	a. Use data in Excel sheet to Create technical charts and graphs Produce Excel Line Graph b. Produce a Pictograph in Excel
21.	To develop lab reports of respective discipline	Create Lab reports using MS Word and Excel	a. Insert Practical subject name in Header and page numbers in Footer
22.	To format a Worksheet in Excel, page setup and print	a. Shade alternate rows of data b. Add currency and percentage symbols c. Change height of a row and width of a column d. Change data alignment e. Insert Headers and Footers f. Set Print Options and Print	a. Format Excel sheet b. Insert headers &footers and print
23.	To familiarize with Ribbon layout &features of PowerPoint 2007.	Use various options in PowerPoint a. Home b. Insert c. Design	Access required options in the tool bar

		d. Animation e. Slideshow f. View g. Review	
24.	To create a simple PowerPoint Presentation	a. Insert a New Slide into PowerPoint b. Change the Title of a PowerPoint Slide c. PowerPoint Bullets d. Add an Image to a PowerPoint Slide e. Add a Textbox to a PowerPoint slide	a. Create simple PowerPoint presentation with photographs/Clip Art and text boxes b. Use bullets option
25.	To Set up a Master Slide in PowerPoint and add notes	a. Create a PowerPoint Design Template b. Modify themes c. Switch between Slide master view and Normal view d. Format a Design Template Master Slide e. Add a Title Slide to a Design Template f. The Slide Show Footer in PowerPoint g. Add Notes to a PowerPoint Presentation	a. Setup Master slide and format b. Add notes

26.	To Insert Text and Objects	a. Insert Text and objects b. Set Indents and line spacing c. Insert pictures/ clipart d. Format pictures e. Insert shapes and word art f. Use 3d features g. Arrange objects	Insert Text and Objects Use 3d features
27.	To insert a Flow Chart / Organizational Charts	a. Create a Flow Chart in PowerPoint b. Group and Ungroup Shapes c. Use smart art	Create organizational charts and flow charts using smart art
28.	To insert a Table	a. PowerPoint Tables b. Format the Table Data c. Change Table Background d. Format Series Legend	Insert tables and format
29.	To insert a Charts/Graphs	a. Create 3D Bar Graphs in PowerPoint b. Work with the PowerPoint Datasheet c. Format a PowerPoint Chart Axis d. Format the Bars of a Chart e. Create PowerPoint Pie Charts	Create charts and Bar graphs, Pie Charts and format.

		f. Use Pie Chart Segments g. Create 2D Bar Charts in PowerPoint h. Format the 2D Chart e. Format a Chart Background	
30.	To Insert audio & video, Hyperlinks in a slide Add narration to the slide	a. Insert sounds in the slide and hide the audio symbol b. Adjust the volume in the settings c. Insert video file in the format supported by PowerPoint in a slide d. Use automatic and on click options e. Add narration to the slide f. Insert Hyperlinks	a. Insert Sounds and Video in appropriate format. b. Add narration to the slide c. Use hyperlinks to switch to different slides and files
31.	To Practice Animation effects	a. Apply transitions to slides b. To explore and practice special animation effects like Entrance, Emphasis, Motion Paths &Exit	Add animation effects

32.	Reviewing presentation	a. Checking spelling and grammar b. Previewing presentation c. Set up slide show d. Set up resolution e. Exercise with Rehearse Timings feature in PowerPoint f. Use PowerPoint Pen Tool during slide show g. Saving h. Printing presentation (a) Slides (b) Hand-out	a. Use Spell check and Grammar feature b. Setup slide show c. Add timing to the slides d. Setup automatic slide show
33	To familiarize with standard toolbox	a. Open Adobe Photoshop b. Use various tools such as i. The Layer Tool ii. The Color& Swatches Tool iii. Custom Fonts & The Text Tool iv. Brush Tool v. The Select Tool vi. The Move Tool vii. The Zoom Tool viii. The Eraser ix. The Crop Tool x. The Fill Tool	Open a photograph and save it in Photoshop

34	To edit a photograph	a. Use the Crop tool b. Trim edges c. Change the shape and size of a photo d. Remove the part of photograph including graphics and text	a. Able to edit image by using corresponding tools.
35	To insert Borders around photograph	a. Start with a single background layer b. Bring the background forward c. Enlarge the canvas d. Create a border color e. Send the border color to the back f. Experiment with different colors	Able to create a border or frame around an image to add visual interest to a photo
36	To change Background of a Photograph	a. open the foreground and background image b. Use different selection tools to paint over the image c. Copy background image and paste it on the	Able to swap background elements using the Select and Mask tool and layers.

		foreground. d. Resize and/or drag the background image to reposition. e. In the Layers panel, drag the background layer below the foreground image layer.	
37	To change colors of Photograph	a. Change colors using: i) Color Replacement tool ii) Hue/Saturation adjustment layer tool	Able to control color saturation
38	To prepare a cover page for the book in subject area	a. open a file with height 500 and width 400 for the cover page. b. apply two different colors to work area by dividing it into two parts using Rectangle tool. c. Copy any picture and place it on work area→ resize it using free transform tool. d. Type text and apply color and style e. Apply effects using blended options	Able to prepare cover page for the book
39	To adjust the brightness and contrast of picture to	a. open a file. b. Go to image→	Able to control brightness/contrast.

	give an elegant look	adjustments→ Brightness/Contrast. c. adjust the brightness and contrast. d. Save the image.	
40	To type a word and apply the shadow emboss effects	a. open a file b. Select the text tool and type text. c. Select the typed text go to layer→ layer style→ blended option→ drop shadow, inner shadow, bevel and emboss→ contour→ satin→ gradient overlay d. Save the image.	Able to apply shadow emboss effects

Table specifying the scope of syllabus to be covered for unit tests

Unit Test	Learning outcomes to be covered
Unit test-1	From 1 to 8
Unit test-2	From 9 to 22
Unit test-3	From 23 to 40

III SEMESTER

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTION AND MODEL BLUE PRINT FOR EVALUATION
CURRICULUM-2023

THIRD SEMESTER

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods Per Year	Scheme Of Examination			
		Theory	Practical		Duration (hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY								
C-301	Engineering Mathematics –II	4		60	3	20	80	100
C-302	Mechanics ofSolids&Theory ofStructures	5		75	3	20	80	100
C-303	Hydraulics	5		75	3	20	80	100
C-304	Surveying-II	4		60	3	20	80	100
C-305	Construction Materials	3		45	3	20	80	100
PRACTICAL								
C-306	CivilEngineering Drawing-I	-	4	60	3	40	60	100
C-307	CAD Practice-I		4	60	3	40	60	100
C-308	Surveying - IIPractice& Plotting	-	4	60	3	40	60	100
C-309	MaterialTesting Practice	-	3	45	3	40	60	100
C-310	Hydraulics Practice	-	3	45	3	40	60	100
	Student Centric Learning Activities	-	3	45				
	Total	**21**	**21**	**630**		**280**	**720**	**1000**

[Note: C-301 is Common with A/AA/CER/EE/M/MET/MNG/TT-301]

ENGINEERING MATHEMATICS-II

Course Code	Course Title	No. of Periods/week	Total No. of periods	Marks for FA	Marks for SA
C-301	Engineering Mathematics-II	4	60	20	80

S.No.	Unit Title	No. of periods	COs mapped
1	Indefinite Integration	20	CO1
2	Definite Integration	10	CO2
3	Applications of Definite Integrals	10	CO3
4	Differential Equations	20	CO4
	Total Periods	60	

Course Objectives	(i) To understand the concepts of indefinite integrals and definite integrals with applications to engineering problems. (ii) To understand the formation of differential equations and learn various methods of solving first order differential equations. (iii) To learn the principles of solving homogeneous and non-homogeneous differential equations of second order.

Course Outcomes	CO1	Integrate various functions using different methods.
	CO2	Evaluate definite integrals.
	CO3	Solve engineering problems by applying definite integrals.
	CO4	Obtain differential equations and solve differential equations of first order and first degree, and solve homogeneous and non-homogeneous differential equations of second order.

C-23 C-301

ENGINEERING MATHEMATICS – II

Learning Outcomes

Unit-I

C.O. 1 Integrate various functions using different methods.

L.O. 1.1. Explain the concept of Indefinite integral as an anti-derivative.

1.2. State the indefinite integral of standard functions and properties of $\int (u+v)\,dx$ and $\int k\,u\,dx$ where *u, v* are functions of *x* and *k* is constant.

1.3. Solve problems involving standard functions using these properties.

1.4. Evaluate integrals involving simple functions of the following type by the method of substitution.

i) $\int f(ax+b)\,dx$, *where f(x)* is in standard form.

ii) $\int (f(x))^n\, f'(x)\,dx,\ n \neq -1$

iii) $\int \frac{f'(x)}{f(x)}\,dx$

iv) $\int [f(g(x))]\,g'(x)dx$

1.5. Find the integrals of *tan x, cot x, sec x* and *cosec x* w.r.t x

1.6. Evaluate the Standard integrals of the functions of the type

i) $\frac{1}{a^2+x^2}, \frac{1}{a^2-x^2}, \frac{1}{x^2-a^2}$

ii) $\frac{1}{\sqrt{a^2+x^2}}, \frac{1}{\sqrt{a^2-x^2}}, \frac{1}{\sqrt{x^2-a^2}}$

iii) $\sqrt{a^2+x^2}, \sqrt{a^2-x^2}, \sqrt{x^2-a^2}$

1.7. Evaluate integrals using decomposition method.

1.8. Solve problems using integration by parts.

1.9 Use Bernoulli's rule for evaluating the integrals of the form $\int u.v dx$.

1.10. Evaluate the integrals of the form $\int e^x[f(x)+f'(x)]dx$

Unit-II

C.O.2 Evaluate definite integrals.

L.O. 2.1. State the fundamental theorem of integral calculus

2.2. Explain the concept of definite integral.

2.3. Solve simple problems on definite integrals.

2.4. State various properties of definite integrals.

2.5. Evaluate simple problems on definite integrals using these properties.

Syllabus for Unit test-I completed

Unit -III

C.O.3Solve engineering problems by applying definite integrals.

L.O. 3.1. Find the area bounded by a curve and axes.

3.2. Obtain the mean and R.M.S values of the simple functions in given intervals.

3.3. Solve simple problems using Trapezoidal rule and Simpson's 1/3 rule for the approximation of definite integrals.

Unit -IV

C.O. 4 Form differential equations and solve differential equations of first order and first degree and Solve homogeneous and non-homogeneous differential equations of second order

L.O. 4.1. Define a Differential equation, its order and degree

4.2 Find order and degree of a given differential equation.

4.3 Form a differential equation by eliminating arbitrary constants.

4.4 Solve the first order and first degree differential equations by variables separable method.

4.5 Solve linear differential equation of first order of the form $\frac{dy}{dx} + Py = Q$, where P and Q are functions of x only or constants.

4.6 Solve homogeneous second order linear differential equations of the type $(aD^2 + bD + c)y = 0$ where $a(\neq 0)$, b, c are real numbers.

4.7 Define complementary function, particular integral and general solution of a non-homogeneous linear differential equation of second order with constant coefficients.

4.8 Describe the methods of solving f(D) = X, where f(D) is a polynomial of second order and X is a function of the forms k, e^{ax}, $\sin ax$, $\cos ax$ and x and their linear combinations.

Syllabus for Unit test-II completed

C-23 C-301
Engineering Mathematics – II
CO/PO – Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	1				3	2	2
CO2	3	2	2	2				3	2	2
CO3	3	3	3	3				3	3	3
CO4	3	3	3	3				3	3	3
Avg.	3	2.5	2.5	2.25				3	2.5	2.5

3 =Strongly mapped (High), **2 =** Moderately mapped (Medium), **1 =** Slightly mapped (Low)

Note: The gaps in CO/PO mapping can be met with appropriate activities as follows:

For PO5: Appropriate quiz programmes may be conducted at intervals and duration as decided by concerned faculty.

For PO6: Seminars on applications of mathematics in various engineering disciplines are to be planned and conducted.

For PO7: Plan activities in such a way that students can visit the Library to refer standard books on Mathematics and access the latest updates in reputed national and international journals. Additionally, encourage them to attend seminars and learn mathematical software tools.

C-23 C-301
Engineering Mathematics – II
PO- CO – Mapping strength

PO no	Mapped with CO no	CO periods addressing PO in column I		Level (1,2 or 3)	Remarks
		Number	%		
1	CO1, CO2, CO3,CO4	60 (20+10+10+20)	100%	3	>40% Level 3 Highly addressed 25% to 40% Level 2 Moderately addressed 5% to 25% Level 1 Low addressed <5% Not addressed
2	CO1, CO2, CO3,CO4	37 (6+6+10+15)	61.6%	3	
3	CO1, CO2, CO3,CO4	37 (6+6+10+15)	61.6%	3	
4	CO1, CO2, CO3,CO4	35 (4+6+10+15)	58.3%	3	
5					
6					
7					
PSO 1	CO1, CO2, CO3,CO4	60 (20+10+10+20)	100%	3	
PSO 2	CO1, CO2, CO3,CO4	37 (6+6+10+15)	61.6%	3	
PSO 3	CO1, CO2, CO3,CO4	37 (6+6+10+15)	61.6%	3	

C-23 C-301
ENGINEERING MATHEMATICS – II
COURSE CONTENTS
Unit-I
Indefinite Integration

1. Integration regarded as anti-derivative, indefinite integrals of standard functions - Properties of indefinite integrals - Integration by substitution or change of variable - Integrals of tan x, cot x, sec x, cosec x.

Evaluation of integrals which are of the following forms:

$$i)\frac{1}{a^2+x^2},\frac{1}{a^2-x^2},\frac{1}{x^2-a^2}$$

$$ii)\frac{1}{\sqrt{a^2+x^2}},\frac{1}{\sqrt{a^2-x^2}},\frac{1}{\sqrt{x^2-a^2}}$$

$$iii)\sqrt{a^2+x^2},\sqrt{a^2-x^2},\sqrt{x^2-a^2}$$

Integration by decomposition of the integrand into simple rational algebraic functions. Integration by parts, Bernoulli's rule and integrals of the form $\int e^x [f(x) + f'(x)]\, dx$.

Unit-II
Definite Integration

2. Definite integral, fundamental theorem of integral calculus, properties of definite integrals, evaluation of simple definite integrals.

Unit-III

Applications of Definite Integrals

3. Area bounded by a curve and axes - Mean and RMS values of a function in given intervals - Trapezoidal rule, Simpson's 1/3 rule to evaluate an approximate value of a define integral.

Unit -IV

Differential Equations

4. Definition of a differential equation - Order and degree of a differential equation - Formation of differential equations - Solutions of differential equations of first order and first-degree using variables separable method and linear differential equation of the type $\frac{dy}{dx} + Py = Q$ - Solutions of homogenous and non-homogeneous linear differential equations of second order with constant coefficients.

Textbook:

Engineering Mathematics-II, a textbook for second year third semester diploma courses, prepared & prescribed by SBTET, AP.

Reference Books:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Schaum's Outlines Differential Equations, Richard Bronson & Gabriel B. Costa
3. M.Vygodsky, Mathematical Handbook: Higher Mathematics, Mir Publishers, Moscow.

C-23 C-301

Engineering Mathematics – II

Unit Test Syllabus

Unit Test	Syllabus
Unit Test-I	From L.O 1.1 to L.O 2.5
Unit Test-II	From L.O 3.1 to L.O 4.8

C- 23 Engineering Mathematics – II

Subject Title : **Engineering Mathematics – II**
Subject Code : **C-301**
Periods/Week : **04**
Periods/Semester : **60**

TIME SCHEDULE

S.No.	Chapter/Unit title	No. of Periods	Marks Allotted	Short Type	Essay Type	COs mapped
Unit – I: Indefinite integration						
1	Indefinite integration	20	34	3	2 1/2	CO1
Unit – II: Definite Integration						
2	Definite Integrals	10	16	2	1	CO2
Unit-III: **Applications of Definite Integrals**						
3	Area of curves	3	3	1	0	CO3
4	Mean and RMS values	3	8	1	1/2	CO3
5	Numerical Integration	4	10	0	1	CO3
Unit – IV: Differential Equations						
6	Introduction to Differential Equations	5	6	2	0	CO4
7	Solutions of first order differential equations	4	13	1	1	CO4
8	Solutions of second order homogeneous differential equations	4	10	0	1	CO4
9	Solutions of second order non-homogeneous differential equations	7	10	0	1	CO4
	Total	60	110	10	8	
			Marks	30	80	

MECHANICS OF SOLIDS AND THEORY OF STRUCTURES

Course Code	Course Title	No. of Periods per Week	Total No. of Periods	Marks for Formative Assessment	Marks for Summative Assessment
C-302	MECHANICS OF SOLIDS AND THEORY OF STRUCTURES	05	75	20	80

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. of Periods	Weightage of marks	No. of Short Answer Questions	No. of Essay Questions	COs Mapped
1.	Theory of simple bending	15	26	2	2	CO1
2.	Deflection of beams	15	26	2	2	CO2
3.	Columns and Struts	10	13	1	1	CO3
4.	Dams and Retaining walls	15	16	2	1	CO3
5.	Statically indeterminate beams	10	16	2	1	CO4
6.	Stresses in frames	10	13	1	1	CO5
	TOTAL	75	80	10	8	

COURSE OBJECTIVES:

Upon completion of the course, the student shall be able to		
Course Objectives	(i)	Understand the concepts of bending stresses, shear stresses and deflection induced in beams.
	(ii)	Understand the effect of loading on columns and their behaviour under loading, stability of Dams and Retaining walls under the action of lateral loads, effects of Loading on statically determinate beams and frames.

COURSE OUTCOMES:

Course Outcomes	CO1	C-302.1	Solve the problems pertaining to Bending equation and Shear stress distribution across the depth of various cross sections.
	CO2	C-302.2	Compute the Slope & Deflection in beams using double integration, Macaulay's & Mohr's Moment-Area methods.
	CO3	C-302.3	Compute 1. The load carrying capacity of columns and 2. Intensity of base pressure acting on dams and retaining walls.
	CO4	C-302.4	Explain the effects of Loading on propped cantilevers, fixed and continuous beams and sketch Shear force and Bending Moment diagram.
	CO5	C-302.5	Calculate the forces in trusses using method of joints and sections.

LEARNING OUTCOMES:

Learning Outcomes	**1.0 Theory of Simple Bending** 1.1 Define simple / pure bending and explain the process of simple bending 1.2 Define a) Neutral layer b) Neutral axis c) Radius of curvature 1.3 List the assumptions made in the theory of simple bending

	and derive the bending equation for simple bending 1.4 Define a) Bending Stress b) Moment of Resistance 1.5 Explain and Sketch bending stress distribution across the depth of the beam for any cross section. 1.6 Define Modulus of section and Flexural rigidity and derive the formula for section modulus of (solid and hollow sections) a) Square Section b) Rectangular Section c) Circular Section 1.7 Solve problems on theory of simple bending for Symmetrical and Unsymmetrical sections to calculate a) Moment of Resistance or b) Load carried or c) Dimensions of cross section. 1.8 State formula for calculation of Shear Stress in any layer of a cross section (Derivation of formulae not required) and Draw shear distribution across a) Rectangular section b) Solid circular section c) I - section d) T - section 1.9 Determine shear stress at any layer and draw shear stress distribution diagram across a) Rectangular section b) I – section

	1.10 Determine the maximum shear stress in circular, rectangular and square sections (Derivation of formulae not required)
	2.0 **Deflection of Beams**
	2.1 Draw the deflected shapes of different types of beams (like simply supported, cantilever, fixed and overhanging beams) and Define -Elastic curve, slope and Deflection
	2.2 Distinguish between strength and stiffness of a beam.
	2.2 Derive relation between slope, deflection and radius of curvature
	2.3 Derive the equations for maximum slope and deflection by double integration method for: a) Cantilever beams with point loads and uniformly distributed loads b) Simply supported beams with central point load or uniformly distributed load throughout.
	2.4 Calculate the maximum slope and deflection in simply supported and cantilever beams using the above formulae
	2.5 Explain Macaulay's method (for Simply supported beams) to find the slope and deflections
	2.6 Compute the maximum slope and deflection for Simply Supported beam carrying point loads and uniformly distributed loads by Macaulay's method
	2.7 Explain the moment area method for slope and deflection and Define Mohr's theorem-I and Mohr's theorem-II
	2.8 Derive formulae for maximum slope and deflection of standard cases by moment area method.
	2.9 Compute the maximum slope and deflections for Cantilever and Simply Supported Beams by Mohr's theorem-I and Mohr's theorem-II (moment area method)

	3.0 Columns and Struts 3.1 Define: i) Compression member ii) Axial Loading iii) List different types of compression members iv) Define: a) Buckling/Critical/Crippling Load b) Actual length c) Least radius of gyration d) Safe load e) Factor of safety 3.2 Calculate least radius of gyration for solid/hollow circular, square and rectangular sections. 3.3 List different end conditions used for a column, 3.4 Define i) Effective/equivalent length ii) Slenderness ratio 3.5 List the effective lengths of columns for different end conditions, Calculate the slenderness ratio for a given column/strut and Classify columns based on slenderness ratio or length and lateral dimensions, Distinguish between Long and short columns. 3.6 State Euler's formula for crippling load of a column/strut (derivation not required) and derive an expression showing limitations of Euler's formula, solve problems on limitations of Euler's formula, Calculate crippling and safe loads on a column/strut with simple/built up section using Euler's formula. 3.7 Explain the validity of Rankine's formula for short and long columns using basic Rankine's empirical formula, Obtain Rankine's formula for crippling load of a column/strut from basic empirical formula, calculate crippling or safe loads on a column/strut with simple/built up section using Rankine's formula. 3.8 Calculate the ratio of strengths of hollow and solid circular columns loaded under same conditions, Design a hollow circular cross section of a column for the given data. **4 Dams and Retaining Walls** 4.1 Define a dam/retaining wall; List the forces acting on a dam/retaining wall. 4.2 Derive the formula for maximum and minimum stress intensities at the base of a Trapezoidal dam with vertical

	water face and sketch the stress distribution at the base of a dam/retaining wall for different conditions, Calculate the stress intensity at base of a rectangular/Trapezoidal dam with or without free board. 4.3 List the conditions for stability of a dam/retaining wall, define middle third rule, define minimum base width of a dam/retaining wall, Derive the formula for minimum base width of a dam with and without free board to avoid tension at the base for the following sections 1. Trapezoidal section 2. Rectangular section 3. Triangular section and calculate the minimum base width based on above formulae 4.4 Explain the procedure to find the stresses at the base of a dam with battered water face and calculate the stresses at the base of a dam with battered water face, Solve the problems on checking the stability of a dam with vertical / inclined water face 4.5 Define: i) Angle of repose of soil ii) Angle of Surcharge iii) Active earth pressure iv) Passive earth pressure 4.6 Compute the lateral earth pressure on a retaining wall having soil face vertical. 4.7 Calculate the stresses at the base of a retaining wall for the above case, the minimum base width of a retaining wall with vertical soil face and levelled earth to avoid tension and sliding at base, the stresses at the base of a retaining wall with levelled earth. 4.8 Check the stability of a retaining wall with soil face vertical 4.9 State Rankine's formula for minimum depth of foundation. **5 Statically Indeterminate Beams** 5.1 Differentiate between a statically determinate and indeterminate structure, define degree of static indeterminacy and Calculate degree of static indeterminacy for Propped

	cantilever, Fixed beam and Two span continuous beam 5.2 Calculate prop reaction of propped cantilever subjected to UDL throughout OR a single point load between fixed and propped ends and Calculate SF and BM values and draw SFD and BMD for a propped cantilever with above type of loading only, Calculate the location of point of contra flexure in propped cantilever for above loading. 5.3 State the merits and demerits of fixed beams 5.4 State the merits and demerits of continuous beams and the effect of continuous supports **6 Stresses in Frames** 6.1 Define a frame. 6.2 Classify the fames based on a) Number of members and b) Number of joints. 6.3 Show the sign convention for different types of stresses in members of a truss/frame. 6.4 Explain the rules for assuming the direction of stresses in the members. 6.5 Explain the method of calculating stresses/forces in the members of a truss/frame by the method of joints. 6.6 Calculate the forces in the members of a simply supported or cantilever truss/frame subjected to DL & LL at nodal points by the method of joints and prepare force table. 6.7 Differentiate method of joints and method of sections. 6.8 Calculate the forces in the members of a simply supported or cantilever truss / frame subjected to DL & LL at nodal points by the method of sections and prepare force table.

PO-CO Mapping:

Course Code: C-302	**Course Title: Mechanics of solids and Theory of Structures No of COs : 5**				**No. of Periods: 75**
POs	**Mapped with CO No**	**CO periods addressing PO in Col 1**		**Level (1,2,3)**	**Remarks**
		Nos.	**%**		
PO1	CO1, CO2, CO3, CO4, CO5	39	52	3	>40% Level.3 (Highly addressed) 25% - 40% Level.2 (Moderately addressed) 5% - 25% Level.1 (Low addressed) <5% Not addressed
PO2	CO1, CO2, CO3, CO4,CO5	36	48	3	
PO3					
PO4					
PO5					
PO6					
PO7					

CO-PO Mapping:

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	3						2	3	1
CO2	2	2						2	3	1
CO3	2	2						2	3	1
CO4	3	2						2	3	1
CO5	3	2						2	3	1
Average	**2.4**	**2.2**						2	3	1

Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz

(vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc

COURSE CONTENT:

1.0 Theory of simple bending.

Theory of simple bending – assumptions – Neutral axis – Bending stress distribution – Moment of resistance – curvature of beams – Bending equation – strength of beams – Rectangular, circular, and L sections practical applications – simple problems- Shear stress in beams – Equation for shear stress in a layer of a beam (Derivation of formula not required) – Shear Stress distribution diagrams for various beam sections such as rectangular, solid circular and I sections – Problems.

2.0 Deflection of Beams

Deflected shapes of beams with different support conditions – Strength and stiffness of beams – Relation between curvature, slope and deflection - Double integration method – Derivation of standard cases – Problems - Macaulay's method for slope and deflection – Simply supported beam under concentrated and uniformly distributed loads – Problems -d) Mohr's theorems for slope and deflection – Cantilevers and simply supported beams with symmetrical loading – Problems.

3.0 Columns and struts

Short and long columns – Axial loading only – solid circular, Hollow circular, Rectangle and I-section and Built up columns – different end conditions – slenderness ratio – calculation of safe load on columns by Euler's and Rankine's formula – Effective length,

radius of gyration and slenderness ratio - limitation of Euler's formula – strength of columns – problems.

4.0 Dams and retaining walls

Introduction – rectangular dams – trapezoidal dams having water face vertical and inclined – Conditions for the stability of a dam – conditions to avoid tension in the masonry dam at its base, to prevent the over – turning of the dam, the sliding of dam and to prevent the crushing of masonry at the base of the dam – Minimum base width of a dam - Active and passive earth pressure – Angle of internal friction – Angle of surcharge – calculation of active earth pressure by Rankine's formula without surcharge - General conditions of stability of retaining walls – middle third rule – Distribution of pressure on foundation of retaining walls – calculation of minimum base width.

5.0 Statically indeterminate beams

Statically determinate and indeterminate structures – definition – degree of static indeterminacy - Cantilever beam with UDL on whole span and propped at free end – cantilever beams with point load between fixed and propped ends – Calculation of prop reaction – SFD and BMD -Fixed Beams: Introduction-Sagging and hogging Bending moments – merits and demerits - Continuous Beams: Merits and demerits – Continuous beams – effect of continuous supports.

6.0 Stresses in frames

Frames – Definition – classification based on number of members and number of joints – Determination of forces in members of statically determinate pin jointed frames – method of sections and method of joints – Application to simple frames and trusses (simply supported and cantilever) under loads at joints.

REFERENCE BOOKS:

1) Strength of Materials, R.K. Rajput, S.Chand Publishers, New Delhi
2) Strength of Materials, S. Ramamurtham, Dhanpat Rai Publishers, New Delhi
3) Strength of Materials, B.C.Punmia, Lakshmi Publications, New Delhi
4) Strength of Materials, R.S. Khurmi, S.Chand Publishers, New Delhi
5) Strength of Materials, R.K. Bansal, Lakshmi Publications, New Delhi

Table specifying the scope of syllabus to be covered for Unit Test-I & Unit Test-II

Unit Test	Learning Outcomes to be covered
Unit Test – I	From 1.1 to 3.8
Unit Test – II	From 4.1 to 6.9

HYDRAULICS

Course Code	Course Title	No. of Periods per Week	Total No. of Periods	Marks for Formative Assessment	Marks for Summative Assessment
C-303	HYDRAULICS	05	75	20	80

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. of Periods	Weightage of marks	No. of Short Answer Questions	No. of Essay Questions	COs Mapped
1.	Properties of Fluids	04	3	1	-	CO1
2	Fluid pressure and its measurements	09	13	1	1	CO1
3.	Flow of Fluids	09	23	1	2	CO2
4.	Flow through orifice and mouth pieces	10	13	1	1	CO3
5.	Flow over notches and weirs	10	16	2	1	CO3
6.	Flow through pipes	10	23	1	2	CO4
7.	Flow through open channels	12	13	1	1	CO4
8.	Pumps and Turbines	08	3	1	-	CO5
9.	Hydroelectric power plants	03	3	1	-	CO5
	Total	75	110	10	8	

COURSE OBJECTIVES:

Upon completion of the course, the student shall be able to		
COURSE OBJECTIVES	(i)	Understand the properties of liquids, water pressure and its measurement, principles of flow of water, flow through Orifice and Mouth Pieces, Flow over notches & weirs, flow through pipes, open channels.
	(ii)	Understand the working principles of pumps & turbines and general lay-out of Hydro-electric Power Plants.

COURSE OUTCOMES*:*

COURSE OUTCOMES	CO1	C-303.1	Solve simple problems on properties of fluids and pressure measurements using various instruments.
	CO2	C-303.2	Solve the problems using the equation of continuity and energies of liquid in motion.
	CO3	C-303.3	Determine coefficient of discharge of a small orifice, mouth piece, Notches & Weirs and Venturi meter.
	CO4	C-303.4	Solve the problems of the major and minor losses of head of water flowing through pipes and channels using relevant formulae
	CO5	C-303.5	Justify the suitability of various Pumps and Turbines for the given conditions.

LEARNING OUTCOMES:

LEARNING OUTCOMES	**1.0 Properties of Fluids** 1.1 Explain the term fluid and give an example 1.2 Differentiate ideal and real fluids. 1.3 Distinguish between fluids & liquids. 1.4 Define the terms like - Mass density, Specific weight, Specific gravity, Adhesion, Cohesion, Surface tension, Capillarity, Compressibility, Viscosity and Vapour pressure. 1.5 State formulae of dynamic viscosity, capillarity, surface tension of water drop and soap bubble. **2.0 Fluid pressure and its measurements** 2.1 Define the terms: Atmospheric pressure, Gauge pressure and Absolute pressure. 2.2 State the relation between the above three pressures. 2.3 Describe the following pressure measuring instruments: Piezometers, U-tube manometers, Differential manometers and Pressure gauges. 2.4 Compute the pressure of a flowing fluid given the readings on

	Piezometers, simple manometers, differential and inverted differential manometers. 2.5 Define Total Pressure and Centre of Pressure. State the formulae for total pressure and centre of pressure on the following surfaces immersed in a liquid at rest: 1. Horizontal plane, 2. Vertical plane and 3. Inclined plane 2.6 Calculate total pressure and centre of pressure for the above plane surfaces for the given conditions. **3.0 Flow of fluids** 3.1 State the different types of flow of liquids 3.2 Define : i) Steady flow and Unsteady flow ii) Uniform flow and Non-uniform flow, iii) Laminar flow and Turbulent flow. 3.3 Distinguish between different types of flow of liquids. 3.4 Define discharge, State units of discharge 3.5 State one dimensional continuity equation. 3.6 Compute the discharge/velocity at a section of flowing liquid in pipe for the given conditions. 3.7 Explain the following energies of liquid in motion 1. Datum head, 2. Pressure head and 3. Velocity head. 3.8 State Bernoulli's theorem of total energy of a liquid in motion. List the limitations of Bernoulli's theorem. Compute the pressure/velocity at a section of flowing liquid in pipe for the given conditions using Bernoulli's equation. List three practical applications of Bernoulli's theorem. 3.9 Describe the working principle of 1. Venturimeter 2. Orifice meter and 3. Pitot tube. 3.10 State the formulae to calculate the actual discharge of flowing liquid throughVenturimeter and Orifice meter. Compute the actual discharge of flowing liquid through Venturimeter and Orifice meter. **4.0 Flow through Orifice and Mouth pieces** 4.1 Define orifice. List different types of orifices. Differentiate large orifice and small orifice. 4.2 Define the terms: Vena-contracta, Cc, Cv, Cd and Cr (Hydraulic coefficients). State the relation between above coefficients. 4.3 State the formula for theoretical discharge through small orifice 4.4 Calculate the discharge, Cc, Cv,Cd and Cr for given conditions-Numerical Problems

	4.5 State the discharge through the large rectangular for given conditions (No derivation) – Numerical problems 4.6 State the equations with standard notations for discharge through Fully submerged Orifice and Partially submerged Orifice. (No Problems) 4.7 State the formula for time of emptying of a prismatic tank by an orifice. Compute the time of emptying of a prismatic tank by an orifice. 4.8 Define mouth piece. Differentiate mouth piece and orifice. Classify mouth pieces. 4.9 State the formulae for discharge for different types of mouth pieces. 4.10 Calculate discharge through a mouth piece for given data- Numerical Problems. **5.0 Flow over notches and weirs** 5.1 Define a notch. List different types of notches. 5.2 State the formulae for the discharge through Rectangular Notch, Triangular notch and Trapezoidal notches. Calculate the discharge through the above notches from the given data. 5.3 Define weir. List different types of weirs. State the formulae for discharge over Sharp crested weir and Broad crested weirs. 5.4 State the formulae for discharge over above weirs with modifications for end contractions and velocity of approach. 5.5 Determine the discharge over sharp crested and broad crested weirs under given conditions – Numerical Problems. 5.6 Write the formulae to determine the discharge for rectangular weir -Francis, and 2. Bazin's empirical formula **6.0 Flow through Pipes** 6.1 List various losses that occur when water flow through pipes. 6.2 Differentiate Major loss and Minor losses. 6.3 State formulae to compute loss of head due to friction using Chezy, and Darcy. 6.4 Solve numerical problems in pipes based on the above two formulae for given data- Numerical problems. 6.5 State formulae for head loss due to various minor losses. 6.6 Compute the above minor losses of head for given data – Numerical problems. 6.7 Define the terms: Hydraulic gradient line and Total energy line. 6.8 Calculate the discharge through Parallel and Compound (series) Pipes connected to reservoir for given data- Numerical Problems. 6.9 Define the terms: Critical velocity and Reynold's number. 6.10 State whether the flow is laminar or turbulent based on Reynold's number. **7.0 Flow through open channels** 7.1 Define open channel flow. Differentiate open channel flow and pipe flow.

	7.2 Define the terms: Wetted perimeter and Hydraulic mean depth. 7.3 State Chezy's formula and Manning's formula for uniform flow through open channels. 7.4 List the Values of 'C' for different surfaces. State the following formulae to evaluate 'C'. (i) Kutter's, formula (ii) Manning's formula and (iii) Bazin's formula 7.5 Calculate Velocity and Discharge in a channel using Chezy's and Manning's formulae for given conditions-Numerical problems. 7.6 Define most economical section of a channel. 7.7 List the conditions for most economical section of Rectangular channel and Trapezoidal channel. 7.8 Design rectangular section for the given conditions 7.9 Design Trapezoidal section for the given conditions **8.0 Pumps and Turbines** 8.1 Define a Pump. List different types of Pumps. Describe the parts of Reciprocating Pump with a sketch. 8.2 Describe the working principle of Single acting and Double acting reciprocating pumps. 8.3 List the functions of air vessels in reciprocating pumps. 8.4 Describes the different parts of centrifugal pumps. Explain the working principle of centrifugal pump. Explain the necessity of priming. Explain the use of Foot valve and Strainer in a centrifugal pump. 8.5 List the pumps to be used for the condition of low head and maximum discharge and vice versa. 8.6 Define Turbine. List types of turbines. List the examples of Impulse Turbine and Reaction turbines. Differentiate between Impulse and Reaction turbines. 8.7 Explain the working principle of Pelton wheel turbine. 8.8 Describe the Parts of Francis Turbine. Explain the purpose of draft tube. List types of draft tubes. **9.0 Hydro-Electric Power Plants** 9.1 Sketch a typical layout of hydro-electric power plant installation. 9.2 List different components of hydro-electric power plant installation. 9.3 Define a surge tank. 9.4 List the functions of surge tank.

PO-CO Mapping:

Course Code: C-303	Course Title: HYDRAULICS No of COs: 5				No. of Periods: 75
POs	**Mapped with CO Nos.**	**CO periods addressing PO in Col 1**		**Level (1,2,3)**	**Remarks**
		No.	**%**		
PO1	CO1, CO2, CO3, CO4, CO5	25	33	2	>40% Level.3 (Highly addressed) 25% - 40% Level.2 (Moderately addressed) 5% - 25% Level.1 (Low addressed) <5% Not addressed
PO2	CO1, CO2, CO3, CO4, CO5	50	67	3	
PO3					
PO4					
PO5					
PO6					
PO7					

CO-PO Mapping:

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2						3	3	3
CO2	2	3						3	3	3
CO3	2	3						3	3	3
CO4	3	2						3	3	3
CO5	2	3						3	3	3
Average	2.4	2.6						3	3	3

Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz

(vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc

COURSE CONTENT:

1. Properties of liquids

Scope and importance of hydraulics in Civil Engineering - Fluids – classification - ideal and real fluids - Difference between fluids and liquids - Properties of liquids - Formulae for Dynamic viscosity, Kinematic viscosity, surface tension of water and soap bubble, capillarity.

2. Liquid pressure and its measurement

Atmospheric pressure, gauge pressure and absolute pressure and relationship - Pressure measuring Instruments – Piezometer- Manometers – U-tube, inverted U-tube and differential manometers –Description - Measurement of the Pressure of a flowing liquid – Piezometer - simple, differential and inverted differential manometers - Total pressure and Centre of pressure on plane surface immersed in liquid – Horizontal, Vertical and inclined plane surfaces and Practical Applications- Numerical Problems on Total pressure and Centre of pressure.

3. Flow of liquids

Types of Flow-Uniform flow, non-uniform flow, stream line flow, turbulent flow, steady flow and unsteady flow - Rate of flow or discharge-continuity equation – one dimensional – Principle -Numerical Problems - Energies of liquid in motion – datum head – pressure head and velocity head - Total energy of liquid in motion – Bernoulli's theorem (without proof) - limitations of Bernoulli's theorem - Numerical Problems - Practical applications of Bernoulli's theorem - venturi meter - orifice meter - pitot tube - Numerical Problems on venturi meter and orifice meter.

4. Flow through Orifices and Mouth Pieces

Orifice-types of Orifices-difference of small and large orifice-Determination of discharge through small Orifice - Vena Contracta-Hydraulic coefficients (Cv,Cc,Cd and Cr) – relation - (No derivation) - Numerical Problems - Large Rectangular Orifice- formula for discharge (No Derivation)- Numerical Problems - Flow through fully submerged and partially submerged orifices-explanation- formula for discharge- (No Problems) - Time of emptying of a prismatic tank by an orifice- Numerical Problems - Mouth piece-Difference between Orifice and Mouth piece - Types of Mouth pieces – equations for discharge-determination of discharge through a Mouth piece from the given details.

5. Flow over Notches and Weirs

Notches - types of notches - rectangular, triangular and trapezoidal notches - Formulae for the discharge over rectangular, triangular and trapezoidal notches-Numerical problems (Derivation of formulae not required) – Weirs - types of weirs – sharp crested and broad crested weirs - Formulae for the discharge over a sharp crested and broad crested weirs - Numerical problems (Derivation of formulae not required) - Equations of discharge for the above weirs with velocity of approach and end contractions - Empirical formulae for discharge over rectangular weir-Francis formula-Bazins formula- (Derivation of formulae& Numerical problems not required).

6. Flow thorough pipes

Major and minor losses - Frictional loss in pipes - Chezy's formula and Darcy's formula (without proof) - Numerical problems - Minor Losses - Loss of head at entrance and exit of pipe, loss of head due to sudden enlargement, sudden contraction – Formulae - simple problems - Hydraulic gradient and total energy line - Discharge through parallel pipes and compound pipes (series) connected to a reservoir - Laminar and turbulent flow in pipes - critical velocity and Reynold's number – significance (no problems).

7. Flow through open Channels

Open channel flow - differences between open channel flow and pipe flow - Geometric properties of channel - Wetted perimeter and hydraulic mean depth - Discharge through open channel –Chezy's formula (derivation not necessary) - Numerical problems - Value of 'C' for different surfaces - Empirical formulae for value of 'C' - Kutter's formula, Manning's formula, Bazin's formula - Conditions for Most economical section of a channel - rectangular and trapezoidal sections - Design of cross sections- problems.

8. Pumps and Turbines

Pumps - types - reciprocating pumps and centrifugal pumps - Reciprocating pumps- singe acting and double acting pumps- description and working – functions of air vessels - Centrifugal pumps -description of parts – working – priming - foot valve and strainer – Turbines - Classification of turbines-impulse and reaction turbines - Impulse turbine - Pelton Wheel, description and working(without problems) - Reaction turbines- Francis and Kaplan turbines - Description and working of Francis turbine (without problems) - Draft tube-purpose and types.

9. Hydro-electric Installation

Sketch a typical layout of a hydroelectric power plant - components – Intake works, Pressure tunnel, Penstock, surge tank, anchor blocks and tailrace - Functions of surge tank.

REFERENCE BOOKS:

1. Fluid Mechanics and Hydraulic Machines by R.K. Bansal, Laxmi Publications.
2. Hydraulics and Fluid Mechanics Including Hydraulics Machines by P. N. Modi & S.M. Seth, Rajsons publications,Pvt.Ltd.
3. Hydraulics, Fluid Mechanics & Hydraulic Machines,R.S Khurmi &N.Khurmi, S.Chand Publications.
4. Fluid Mechanics,Frank white, SIE

Table specifying the scope of syllabus to be covered for Unit Test-I & Unit Test-II

Unit Test	Learning Outcomes to be covered
Unit Test – I	From 1.1 to 5.2
Unit Test – II	From 5.3 to 9.4

SURVEYING-II

Course Code	Course Title	No. of Periods per Week	Total No. of Periods	Marks for Formative Assessment	Marks for Summative Assessment
C-304	SURVEYING-II	04	60	20	80

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. of Periods	Weightage of marks	No. of Short Answer Questions	No. of Essay Questions	COs Mapped
1	Theodolite Survey	14	26	2	2	CO1
2.	Trigonometric levelling	9	13	1	1	CO2
3.	Tacheometry	9	26	2	2	CO3
4	Curves	14	26	2	2	CO4
5	Advanced surveying using GPS and GIS	9	13	1	1	CO5
6	Introduction to Drone Surveying	5	6	2	-	CO5
	Total	60	110	10	8	

COURSE OBJECTIVES:

Upon completion of the course, the student shall be able to		
COURSE OBJECTIVES	(i)	Develop skills in using Theodolites and Know about applications of principles of Trigonometric levelling and Tacheometry.

	(ii)	Understand the need for setting out the curves and methods of setting out simple curves
	(iii)	Understand the principles of advanced surveying systems viz., GPS, GIS, Drone Surveying and their applications.

COURSE OUTCOMES:

COURSE OUTCOMES	CO1	C-304.1	Suggest with justification in the use of theodolite for Traversing
	CO2	C-304.2	Describe the principles of Trigonometrical Levelling and compute the distance and elevation for different conditions.
	CO3	C-304.3	Find the vertical and horizontal distances using stadia & tangential tacheometry.
	CO4	C-304.4	Calculate the data required for setting out simple circular curve
	CO5	C-304.5	Explain the concepts of GPS, GIS,Drone Surveyingand their applications in Civil Engineering.

LEARNING OUTCOMES:

LEARNING OUTCOMES	**1.0 Theodolite survey** 1.1 List the uses and types of a Theodolite, differentiate between transit and non-transit theodolites, List the parts of a transit Theodolite, explain the functions of parts of a transit theodolite. 1.2 Define the terms Face left observation, Face right observation, Swing of telescope, telescope normal and Telescope inverted, List the fundamental lines of a transit Theodolite, explain the relationship of fundamental lines of theodolite, Explain the steps involved in carrying out temporary adjustments of a transit theodolite for taking observations, Read the reading of vernier and least count 1.3 Explain the method of measuring the horizontal angle by repetition method, rule out the page of a theodolite field book, calculate the angle by the method of repetition, List the errors eliminated in repetition method 1.4 Explain the method of measuring of horizontal angle by reiteration method, Rule the page of a theodolite field book, explain the method of calculating angles by method of reiteration 1.5 Explain the method of measurement of Direct angles and Deflection angles, explain the Steps involved in setting out angles using a theodolite.

	1.6 Explain the methods of measurement of vertical angles, magnetic bearing of a line, Explain the methods of prolonging a given survey line 1.7 Explain the method of conducting traverse survey by Included angles method, Deflection angles method and Magnetic bearing method,Check the angular measurements and apply corrections in a closed traverse 1.8 Define Latitude and Departure of a line, Compute the latitudes and departures of survey lines of a closed traverse, calculate the error of closure of a closed traverse. 1.9 Enumerate the difference between consecutive and independent co-ordinates, Calculate the consecutive and independent co-ordinates of stations of a closed traverse and calculate the area of a closed Traverse by independent co-ordinates 1.10 List the types of errors in theodolite surveying. **2.0 Trigonometric Levelling** 2.1 Define trigonometrical levelling 2.2 Explain different cases that occur in trigonometrical levelling to find the elevation and distance of a given object (base of the object accessible or inaccessible) 2.3 Derive formula for finding height and elevation of an object when the base of the object is accessible. 2.4 Calculate the height and elevation of an object when the base of the object is accessible. 2.5 Derive the formula to find the distance and elevation of the object when the base of the object is inaccessible and instrument stations and object are in the same vertical plane 2.6 Calculate the distance and elevation of the object when the base of the object is inaccessible and instrument stations and object are in the same vertical plane 2.7 Describe the procedure to find the distance and elevation of the object when the base of the object is inaccessible and instrument stations and object are not in the same vertical plane. 2.8 Calculate the distance and elevation of the object when the base of the object is inaccessible and instrument stations and object are not in the same vertical plane. **3.0 Tacheometry** 3.1 Define tacheometry and uses of tacheometry and explain the principles of stadia tacheometry, List the different methods of tacheometry, define staff intercept 3.2 List the constants of tacheometry in stadia tacheometry

	3.3 Derive the formulae to determine the horizontal distance of staff station from the instrument station using stadia tacheometry, when the line of collimation is horizontal with staff held vertical 3.4 Derive the formulae to determine the elevation of the staff station using stadia tacheometry, when the line of collimation is horizontal with staff held vertical, Calculate the horizontal distance of staff station from the instrument station and its elevation when the line of collimation is horizontal with staff held vertical. 3.5 Explain the procedure for determining tacheometric constants, State the use of analytic lenses 3.6 Write the formulae to determine the horizontal distance of staff station from the instrument station using stadia tacheometry When the line of collimation is inclined with staff held vertical (without derivation), Write the formulae to determine the elevation of the staff station using stadia tacheometry When the line of collimation is inclined with staff held vertical (without derivation) 3.7 Calculate the horizontal distance of staff station from the instrument station and its elevation when the line of collimation is inclined with staff held vertical, Compute the horizontal distance and difference in elevations between any two staff stations (instrument station and staff stations are lying in the same vertical plane and when the instrument station and staff stations are not lying in the same vertical plane) using stadia tacheometry 3.8 Explain the principle of Tangential Tacheometry, enumerate the difference between Stadia and tangential tacheometry **4.0 Curves** 4.1 List the types of horizontal curves 4.2 Define Simple curve 4.3 Define degree of curve and state the relation between the radius and degree of curve according to chord length / arc length and Calculate degree of curve using above relations 4.4 Sketch a simple circular curve and show its elements 4.5 Define various elements of a simple circular curve 4.6 Compute the length of curve, tangent length, length of long chord and mid ordinate, apex distance and chainages at salient points of a curve 4.7 List the linear and angular methods of curve setting 4.8 Explain the procedure for setting out a curve by linear methods

	5.0 Advanced surveying using GPS and GIS 5.1 List the modern surveying techniques 5.2 Define GPS and explain the working principle of GPS 5.3 Explain the segments of GPS and Enumerate the types of GPS receivers 5.4 Explain taking coordinates of various points using GPS 5.5 List the applications of GPS in civil Engineering 5.6 List merits and demerits of GPS 5.7 Define GIS and State the components of GIS 5.8 List and explain the types of data used in GIS 5.9 Define map and list the types of map projections 5.10 List the uses and applications of GIS in civil Engineering **6.0 Introduction to Drone surveying** 6.1 State the purpose and principle of Drone Surveying 6.2 State the History of drones/UAAS/UAVs 6.3 Explain the application of drone in surveying, Mapping, Irrigation and Agriculture 6.4 Explain the application of drone in engineering, land survey and transportation. 6.5 Compare drone survey with other surveys in respect of accuracy 6.6 Explain the Techniques for controlling errors 6.7 GCP (Ground control points) in vertical and horizontal accuracies.

PO-CO Mapping:

Course Code: C- 304	**Course Title: SURVEYING-II** **No. of COs: 5**				**No. of Periods: 60**
POs	**Mapped with CO Nos.**	**CO periods addressing PO in Col.1**		**Level (1,2,3)**	**Remarks**
		No.	**%**		
1	CO1, CO2, CO3, CO4, CO5	24	40	3	>40% Level.3 (Highly addressed) 25% - 40% Level.2 (Moderately addressed) 5% - 25% Level.1 (Low addressed) <5% Not addressed
2	CO1, CO2, CO3, CO4, CO5	15	25	2	
3					
4	CO1, CO2, CO3, CO4, CO5	15	25	2	
5	CO2, CO4, CO5	6	10	1	
6					

CO-PO Mapping:

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2		2				1	2	2
CO2	2	2		3	2			1	2	2
CO3	3	2		3				1	2	2
CO4	3	3		3	2			1	2	2
CO5	3	3		2	2			1	2	2
Average	2.6	2.4		2.6	2			1	2	2

Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz
(vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc

COURSE CONTENT:

1.0 Theodolite Surveying

Component parts of a transit theodolite and their functions – Definitions of technical Terms – Station, face left, face right, swinging the telescope, transiting - Fundamental lines of a transit theodolite – Horizontal axis, vertical axis, axis of telescope, axis of plate levels, axis of altitude bubble, line of collimation – Conditions of adjustments - Temporary adjustments of a transit theodolite - Measurement of horizontal angles by repetition and reiteration method - Measurement of vertical angles - Booking readings - Measurement of magnetic bearings, deflection angles, direct angles – Prolonging a straight line – by single transiting, double transiting and fore sighting methods -Errors in theodolite work - Theodolite Traversing - Traversing with theodolite by included angles method, deflection angles method and magnetic bearing method - Checks for closed and open traverse - Traverse computations – Latitude and departure – closing error – consecutive and independent coordinates - area of closed traverse.

2.0 Trigonometric levelling

Principle and necessity of Trigonometric levelling - Elevations and distances of objects whose base is accessible or inaccessible, with instruments stations and object in the same vertical plane or in different vertical planes.

3.0 Tacheometry

Tacheometry – principle – uses – types – stadia and tangential tacheometry -Stadia Tacheometry with staff held vertical and line of collimation horizontal or inclined – elevations and distances of staff stations – determination of Tacheometric constants - Tachometric tables – problems.

4.0 Curves

Curves – types of horizontal curves – simple, compound and reverse curves – degree of curve – formulae for degree of curve using 20m / 30m chain – elements of simple circular curve – Point of commencement of curve, point of tangency, forward and back tangents, point of intersection, angle of intersection, deflection angle, length of curve, tangent length, long chord, mid ordinate, normal chord and sub chord -Calculation of elements of simple circular curve -Method of curve setting – chain and tape methods – offsets from long chord method, successive bisection of arcs method, off sets from tangent (radial and Perpendicular offsets) method and off sets from chords produced method.

5.0 Advanced surveying using GPS and GIS

Global Positioning system (GPS) – principles – segments – space control and user segments – receivers – observation and data processing – applications in Civil Engineering – advantages and disadvantages of GPS – Geographical information systems (GIS) – definition – components – Map – Map projections – types of data used – use and application in civil engineering.

6.0 Introduction to Drone surveying

Purpose and principle of Drone Surveying - History of drones/UAAS/UAVs - Application of drone

in surveying, Mapping, Irrigation and Agriculture - Application of drone in engineering, land

survey and transportation - Comparison of drone survey with other surveys in respect of

accuracy -Techniques for controlling errors - GCP (Ground control points) in vertical and

horizontal accuracies.

REFERENCE BOOKS:

1) Surveying Vol.I&Vol.II by B.C Punmia, Ashok Jain & Arun Jain, Laxmi publications

2) Surveying Vol.I&Vol.II by Dr.K.R. Arora, Rajsons Publications Pvt.Ltd

3) Surveying Vol.I&Vol.II by T.P.Kanetkar and S.V. Kulakarni, Pune Vidyarthi GrihaPrakashan

4) Surveying Vol.I&Vol.II by S.S Bhavikatti, I.K International Publishing House.

5) Surveying Vol.I&Vol.II by S.K.Duggal, M.C.Graw Hill Publications.

Table specifying the scope of syllabus to be covered for Unit Test-I & Unit Test-II

Unit Test	Learning Outcomes to be covered
Unit Test – I	From 1.1 to 3.8
Unit Test – II	From 4.1 to 6.7

CONSTRUCTION MATERIALS

Course Code	Course title	No. of Periods per week	Total No. of Periods	Marks for Formative Assessment	Marks for Summative Assessment
C-305	Construction Materials	03	45	20	80

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. of Periods	Weightage of marks	No. of Short Answer Questions	No. of Essay Questions	COs Mapped
1	Stones	06	13	1	1	CO1
2	Bricks	06	13	1	1	CO2
3	Clay products & Sand	09	26	2	2	CO3
4	Cement	07	16	2	1	CO4
5	Mortars & Concrete	10	26	2	2	CO4
6	Timber, Plastics, Glass & Asbestos	07	16	2	1	CO5
	Total	45	110	10	08	

COURSE OBJECTIVES*:*

Upon completion of the course, the student shall be able to		
COURSE OBJECTIVES	(i)	Familiarize with the various materials used in civil engineering constructions.
	(ii)	Acquire the concepts of selection of appropriate construction materials for various Civil Engineering structures /elements.

COURSE OUTCOMES:

COURSE OUTCOMES	CO1	C-305.1	Select appropriate stones and their acceptability for construction work
	CO2	C-305.2	Explain the acceptability of bricks for construction work.
	CO3	C-305.3	Explain suitability of tiles, pipes and building sand for Construction
	CO 4	C-305.4	Check the suitability of cement, mortar and concrete for various construction works
	CO 5	C-305.5	Select different types of Wood, Plastics, Glass and Asbestos for construction work.

LEARNING OUTCOMES:

LEARNING OUTCOMES	**1.0**	**Stones**
	1.1	Give Physical classifications of rocks.
	1.2	List characteristics of good building stone.
	1.3	List common varieties of stone used in different items of construction and their suitability for construction works (like Granite, marble, Kadapa slabs, Shahabad stones)
	1.4	Explain the purpose of dressing of stones.
	1.5	Select a type of a stone for a given situation / construction.
	2.0	**Bricks**
	2.1	State the common sizes of bricks – as per IS specifications.
	2.2	List the characteristics of good bricks.
	2.3	List the standard tests on bricks like Water absorption test and Compressive strength test.
	2.4	Explain Water absorption test and Compressive strength tests on brick.
	2.5	Explain the uses of bricks for construction purposes - Refractory bricks, Fly ash bricks, Precast Solid Concrete Blocks, Hollow concrete blocks, High quality building blocks.
	3.0	**Clay products & Sand**
	3.1	State the common varieties of tiles used for different purposes.
	3.2	List the characteristics of good tiles.
	3.3	List the uses of porcelain and glazed tiles.
	3.4	State the uses of stone ware pipes.
	3.5	List the characteristics of good sand.
	3.6	State the functions of building sand.
	3.7	State the percentage of bulkage allowance for construction work.
	3.8	State the need for the quarry dust as a substitute of sand.
	3.9	Select suitable tile, pipe and fine aggregate for construction work.

	4.0 Cement 4.1 State the chemical composition of cement. 4.2 State rough and ready methods of examining cement 4.3 Explain the method of manufacture of cement by dry process only. 4.4 Give the Classification of cements 4.5 List the three uses of various cements 4.6 State the different standard tests on cement. 4.7 Explain the tests on cement like Fineness, Consistency, Setting times and soundness. 4.8 State grades of cement and their compressive strengths. 4.9 State the importance of blended cement 4.10 Explain the application of blended cement with fly ash and blast furnace slag. **5.0 Mortars and Concrete** 5.1 State Fine aggregate and Coarse aggregate. Explain the various tests conducted for Aggregates like water absorption and sieve analysis (Procedure of tests not necessary). 5.2 Give the Classification of mortars. List the proportion of mortars for various works like plastering, masonry, flooring etc., Explain the method of preparation of cement mortar 5.3 Explain the use of super plasticiser for improving workability and strength. 5.4 List the ingredients of PCC and RCC. State the usual proportions of plain and reinforced concrete for different items of work. 5.5 Define Hydration of cement, Water cement ratio, Workability, Curing. Explain the importance of Hydration of cement and water cement ratio. 5.6 Explain the method of preparing concrete. List the steps involved in preparation of concrete from mixing to curing. List different curing compounds. List the methods of curing suitable for different surfaces. 5.7 List different tests conducted for determining the workability of concrete. Explain the procedure of conducting the following tests on concrete i.e., Slump test and Compressive strength test. 5.8 List various types of admixtures used in concrete. List uses of admixtures used in concrete. Explain about ready mix concrete. List the advantages and disadvantages of ready-mix concrete. 5.9 List the uses of Fly ash, Quarry dust for improving durability and resistance to adverse exposure conditions. 5.10 Differentiate normal strength concrete and high strength concrete. Understand the following special concretes (i) Fibre reinforced concrete (ii) FAL-G concrete (iii) Light

	weight concrete (iv) High density concrete (v) Polymer concrete (vi) Self-compacting concrete. Explain micro concrete and shotcrete. **6.0 Timber, Plastics, Glass & Asbestos** 6.1 List characteristics of good timber. Define seasoning. Explain the importance of seasoning of timber 6.2 Name common varieties of timber used in A.P for various Civil Engineering works. 6.3 State various types of wood products used in construction work. 6.4 List the uses of wood products used in construction work. 6.5 List the uses of fibre reinforced plastic. 6.6 List the merits and demerits of plastics. 6.7 List the merits and demerits of asbestos products. 6.8 Explain suitability of different types of glasses as a building material. 6.9 List the merits and four demerits of glass. 6.10 Explain suitability of Powder coated Aluminium and Steel sheets as building material.

PO-CO Mapping:

Course Code : C-305	**Course Title: CONSTRUCTION MATERIALS No. of COs: 5**				**No. of Periods: 45**
POs	**Mapped with CO No.**	**CO Periods addressing PO in Col 1**		**Level (1,2,3)**	**Remarks**
		No.	%		
PO1	CO1, CO2, CO3, CO4, CO5	30	67	3	> 40% Level 3 (Highly addressed) 25% to 40% Level 2 (Moderately addressed) 5% to 25% Level 1 (Low addressed) <5% Not Addressed
PO2					
PO3					
PO4	CO1, CO2, CO3, CO4	12	25	2	
PO5	CO4, CO5	3	8	1	
PO6					
PO7					

CO-PO Mapping:

CO No.	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	3			2					2	1
CO2	3			2					2	2

CO3	3			2					2	2
CO4	3			2	1				2	2
CO5	3				2				2	2
Average	3.0			2.0	1.5				2.0	1.8

Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz

(vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc

COURSE CONTENT

1) **Stones**

Classification of rocks, physical classification - Characteristics of good building stone - Common varieties of stones - granite, marble, Kadapa slab, Shahabad stones - Dressing of stones – purpose.

2) **Bricks**

Specification for bricks as per IS-1077-1971 - Characteristics of good bricks - Testing of bricks as per IS-3495-1966 – water absorption and compressive strength test on bricks - Refractory bricks and their uses - Fly ash bricks.

3) **Clay products & Sand**

Tiles –Types of tiles roofing tiles (Mangalore tiles), floor tiles, Ceramic tiles, Vitrified tiles, Morbonite - Characteristics of good tiles - Porcelain – glazed tiles (uses only) - Stone ware pipes – uses - Characteristics of good sand, Functions of sand - Bulking of sand – percentage of bulking – bulkage allowance to be permitted - Crushed stone powder as substitute of sand.

4) **Cement**

Chemical composition of cement - Rough and ready method of testing cement - Methods of manufacture of cement – Dry process - Classification of cement – ordinary Portland cement, quick setting cement, white cement –Rapid hardening cement, Low heat cement, High alumina cement, Blast furnace slag cement and Pozzolana cement – uses of different types of cement - Tests on cement as per ISI – fineness, consistency, setting time, soundness tests - Blended cement.

5) **Mortars & Concrete**

Fine aggregate and course aggregate – Water absorption and sieve analysis of fine and coarse aggregates - Mortar – Classification of mortar – Lime mortar, cement mortar, Surkhi mortar, Blended mortar - Different proportions of mortars for various works - Preparation of cement mortar - Ingredients of plain concrete - Proportioning – usual proportions for different item of work - Foundation, Footings, Columns, Slabs & Beams for ordinary buildings - Plain concrete and reinforced concrete -

Water cement ratio – factors effecting water cement ratio - Workability – Slump test on fresh concrete, hardened concrete – compressive strength test on hardened concrete - Admixtures – definition – types – Chemical admixtures – Plasticizers (water reducers), super plasticizers, air entraining agents, accelerators, retarders and bonding admixtures – Mineral admixtures – Pozzolanas -fly ash, ground granulated blast furnace slag, silica fume, rice husk ash and metakaoline – Gas forming – Powered zinc, powdered aluminium and hydrogen peroxide – uses - Method of preparation of concrete – Hand and machine mixing - Procedure of mixing, conveyance, placing compaction, and curing of concrete - Curing –different curing compounds - methods – suitability - Introduction to ready mix concrete – Advantages and disadvantages - Use of fly ash, quarry dust. Normal strength concrete - High strength concrete- Special concretes like Fibre reinforced concrete, FAL-G concrete, Light weight concrete, High density concrete, Polymer concrete and Self-compacting concrete - Micro concrete and Shotcrete.

6) Timber, Plastics, Glass and Asbestos

Characteristics of good timber - Seasoning of timber – Importance - Common varieties of timber used for different items of work – Doors and windows, form work, centring with particular references of A.P - Wood products-veneer – Ply wood, particle board, laminated board, straw board – Eco board - Types of plastics – fibre reinforced plastics for plastic doors and windows and water tanks - Use of asbestos – manufacture of asbestos sheets and pipes - Types of glasses and uses.

REFERENCE:

1. Engineering Materials by Rangwala, Charotar Publishing House Pvt. Ltd
2. Building Materials by S.K. Duggal, New age International Publishers.
3. Building materials by M.L Gambhir, Neha Jamwal, Mc.Graw Hill Publications
4. Building Materials by P.C Varghese, PHI Learning.
5. Building Materials by Ravi Kumar Sharma, I.K International Publishing House Pvt. Ltd.

Table specifying the scope of syllabus to be covered for Unit Test-I & Unit Test-II

Unit Test	Learning outcomes to be covered
Unit Test-I	From 1.1 to 3.9
Unit Test-II	From 4.1 to 6.10

CIVIL ENGINEERING DRAWING-I

Course Code	Course Title	No. of Periods per Week	Total No. of Periods	Marks for Formative Assessment	Marks for Summative Assessment
C-306	CIVIL ENGINEERING DRAWING-I	04	60	40	60

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. of Periods	Weightage of marks	No. of Short Answer Questions	No. of Essay Questions	COs Mapped
1	Introduction	6	8	2	-	**CO1**
2	Residential Buildings	30	29	1	1	**CO2**
3	Public and Industrial Buildings	14	19	1	1	**CO3**
4	Working drawings	10	4	1	-	**CO4**
	Total	60	60	5	2	

Note: In question paper, Part –A consists of FIVE questions of 4 marks each and Part –B consists of two questions of 25 & 15marks each from the chapters2(25 marks, Residential Buildings) and Chapter 3(15 marks, Public and Industrial Buildings)

COURSE OBJECTIVES:

Upon completion of the Course, the student shall be able to		
COURSE OBJECTIVES	(i)	Apply the standard practices in building drawing, understand setbacks, orientation of buildings and Vaastu Shastra.

	(ii)	Prepare drawings of different components of building, site plans, single storeyed buildings, line drawings of public & industrial buildings with fire safety, working drawings manually.

COURSE OUTCOMES:

COURSE OUTCOMES	CO1	C-306.1	Practice drawing different components of buildings and drawing site plans as per local bye laws, orientation of buildings and Vaastu Shastra.
	CO2	C-306.2	Practice drawing plan, elevation and section of residential buildings, framed structures, given line diagram and specifications.
	CO3	C-306.3	Draw the line diagrams of Hospitals, Hostels, Schools and Apartments for the given requirements with fire safety and provision for Physically disabled and aged people.
	CO4	C-306.4	Draw the working drawings for foundation marking, electrical layout and solar water heater.

LEARNING OUTCOMES:

LEARNING OUTCOMES	**1.0**	**INTRODUCTION**
	1.1	Sketch the conventional signs of Civil Engineering materials, Plumbing and Electrical fixtures.
	1.2	Draw the cross section of load bearing wall and name all components below and above ground level.
	1.3	Draw the plan of one Brick wall meeting at corner showing alternative courses of header and stretchers in English bond.
	1.4	Draw the following views of a fully panelled door and label the parts 1. Elevation and 2. Sectional plan
	1.5	Draw the following views of fully panelled window and glazed window and label the parts. 1. Elevation and 2. Sectional plan
	1.6	Draw the following views of glazed window and label the parts. 1. Elevation and 2. Sectional plan
	1.7	Draw the elevation of the following trusses and label the parts with the given data (details of joints not required) 1. King post truss and 2. Queen post truss
	2.0	**RESIDENTIAL BUILDINGS**
	2.1	Draw the site plan of a residential building as per local byelaws and NBC (National Building Code).
	2.2	Draw the following views of single storeyed load bearing

type residential building from the given line diagram and set of specifications for a) One room with veranda b) one-bedroom house c) two-bedroom house

1. Plan
2. Section and
3. Elevation

2.3 Draw the following views of single storied framed structure type residential building from the given line diagram and set of specifications for a) One-bedroom house b) Two-bedroom house

1. Plan,
2. Section and
3. Elevation

2.4 Draw the following views of a dog legged stair with given specifications.

1. Plan, and 2. Section

2.5 Draw the following views of two- storied residential building (framed Structure) from the given the line diagram and set of specifications.

1. Plans of first and second floors and
2. Elevation

2.6 Prepare the drawings in the standard format for obtaining sanction from a local body for a residential building (Two storeyed, two bed room building) including a rain water harvesting structure

2.7 Principles of Vastu with Scientific approach.

3.0 PUBLIC AND INDUSTRIAL BUILDINGS

3.1 Rural hospital of 10 beds capacity

3.2 Hostel for 50 students

3.3 Primary school of 250 to 300 students

3.4 Apartments - Plan of one floor with 6 to 10 units @ 90 –150 sq.m /unit

3.5 Provisions of Fire Safety

3.6 Provision for Physically disabled and aged people.

4.0 WORKING DRAWINGS

4.1 Prepare a working drawing for the purpose of marking the width of foundation for the given plan of a building

4.2 Calculate the following for the given plan of a building

1. Plinth area,
2. Carpet area and
3. Floor area ratio/ Floor spaces Index.

4.3 Prepare a working drawings for electrical layout for a given

	residential building (2 bed room buildings-ground floor only). 4.4 Draw the typical layout of active solar water heating system.

PO-CO Mapping:

Course Code: C-306	**Course Title: Civil Engineering Drawing – I No. of COs: 4**				**No. of Periods: 60**
POs	**Mapped with CO Nos.**	**CO periods addressing PO in Col.1**		**Level (1,2,3)**	**Remarks**
		No.	**%**		
PO1	1,2,3,4	17	19	1	>40% Level.3 (Highly addressed) 25% - 40% Level.2 (Moderately addressed 5% - 25% Level.1 (Low addressed) <5% Not addressed
PO2	1,2,3,4	43	48	3	
PO3	1,2,3,4	30	33	2	
PO4					
PO5					
PO6					
PO7					

CO-PO Mapping:

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	3					3	3	3
CO2	3	3	3					3	3	3
CO3	2	2	2					3	3	3
CO4	2	2	2					3	3	3
Average	2.5	2.5	2.5					3	3	3

Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz

(vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc

COURSE CONTENT

1.0 Introduction

1.1 Conventional signs for materials like bricks, stone, concrete, wood, glass, earth, steel and electrical fixtures like ceiling fan, bulb, main switch, refrigerator, bell push, buzzer, A.C motor, and water supply and sanitary fixtures like tap, wash basin, sink, W.C pan (Indian and European type), shower, flush tank.

1.2 Cross section of a load bearing wall showing all the components below and above the ground level.

1.3 Plan of one brick wall meeting at a corner showing odd and even courses in English bond,

1.4 Plan and Cross section of a Fully panelled door

1.5 Plan and Cross section of a Fully panelled window and glazed window showing all the component parts

1.6 Elevation of King post and Queen post trusses with the given Data (details of joints not required)

2.0 Residential Buildings

2.1 Setbacks and orientation principles for planning residential buildings as per local bye laws and NBC.

2.2 Single storied two bed room load bearing residential building

2.3 Single storied framed structure two-bedroom residential building

2.4 Two-storied residential building (framed structure type)

2.5 Dog legged stair

2.6 The standard format for obtaining sanction from local body for a residential Building (up to two-bedroom building–G+1 floors) including a rainwater harvesting structure.

2.7 Principles of Vaastu with Scientific approach

3.0 Public and industrial buildings

Draw the line diagrams only showing the functional requirements of

3.1 Rural hospital of 10 beds capacity

3.2 Hostel for 50 students

3.3 Primary school of 250 to 300 students

3.4 Apartments - Plan of one floor with 6 to 10 units @90 – 150 sq.m / unit

3.5 Provisions of Fire Safety

3.6 Provision for Physically disabled and aged people.

4.0 Working drawings

4.1 Working drawing for the purpose of marking from the given plan and width of foundation.

4.2 Calculates the following for the given plan of a building

1. Plinth area,
2. Carpet area and
3. Floor area ratio/ Floor spaces Index.

4.3 Prepares a working drawings for electrical layout for a given residential building (2 bed room buildings-ground floor only).

4.4 Draws the typical layout of active solar water heating system.

REFERENCE BOOKS:

1. Civil Engineering Drawing by Chakra borthy, UBS Publications.
2. Civil Engineering Drawing & House Planning by B.P Verma, Khanna Publishers.
3. Building Planning & Drawing by Dr.N.Kumara swamy, A.Kameswararao, Charotar Publishing
House Pvt.Ltd.
4. Building Planning & Drawing by S.S Bhavikatti, M.V Chitawadagi, I.K International publishing
house Pvt.Ltd.

CAD PRACTICE-I

Course code	Course Title	No. of periods/week	Total No. of periods	Marks for Formative Assessment	Marks for Summative Assessment
C-307	CAD Practice-I	04	60	40	60

S. No.	CHAPTER/UNIT TITLE	No. of Periods	COs Mapped
1.	Introduction to Computer Aided Drafting	8	CO1
2.	Practice on CAD software	16	CO2
3.	Preparation of 2-D drawings for residential buildings using CAD Software as per building bye laws in Panchayat / Municipality/Corporation	24	CO3
4	Preparation of 3-D drawings using CAD software	12	CO4
	Total	60	

COURSE OBJECTIVES:

Course Objectives	(i)	Know the importance of Computer Aided Drafting (CAD) and to Practice CAD, drawing editor and to perform different operations using CAD Commands
	(ii)	Prepare drawings of different components of building, site plans, single storeyed buildings, line drawings of public & industrial buildings, working drawings by using CAD 2D and 3D.

COURSE OUTCOMES:

Course Outcomes	CO1	C-307.1	Dimensions a given drawing using standard notation and desired system of dimensioning, Practices drawing different components of buildings.
	CO2	C-307.2	Practices drawing plan, elevation and section and site plan of residential buildings, and framed structures as per local bye laws
	CO3	C-307.3	Practices drawings to be submitted to Panchayat/Municipality/Corporation for Residential and Commercial building approval
	CO4	C-307.4	Practices 3-D drawings using CAD software

LEARNING OUTCOMES:

Learning Outcomes	**1.0 INTRODUCTION TO COMPUTER AIDED DRAFTING** • State the applications and advantages of CAD • State the advantages of CAD • State the features of CAD as drafting package • State the hardware requirements to run CAD **2.0 PRACTICE ON CAD SOFTWARE** • Study the drawing editor screen. • Practice the methods of selecting/entering commands to start new drawing accessing CAD commands by selecting from menus, tool bars and entering Commands on command line. • Set the limits of the drawing to get the needed working area. • Practice the 'setting commands' Grid, Snap, & Ortho Commands. • Practice 'Draw commands'- point, line, pline, rectangle, circle, tangent, ellipse, arc, polygon and spline. • Dimension the given figures. • Practice 'modify commands' – erase, copy, mirror, move, rotate, scale, stretch, trim, extend, break, chamfer, fillet, explode, Pedit, Mledit. • Practice 'construct commands' – offset, array, Divide measure. • Practice 'edit commands' – Undo, Redo, Oops, Copy Clip, Paste Clip, Del. • Practice 'view commands' – Redraw, Regen, Zoom, Pan. • Practice 'Hatch commands' – Bhatch, Hatch. • Practice 'insert commands' – Block, Wblock, Insert, Minsert. • Practice dividing a line into number of segments. • Practice drawing external/internal common tangents for circles of same/different radii. • Practice drawing external/internal common arcs for circles of same/different radii. • Practice construction of ellipse, parabola, hyperbola, cycloid, and helix **3.0 Practice 2-D drawings of residential buildings using CAD Software** • Practice conventional signs used in civil engineering. • Practice drawing elevation of panelled door partly panelled and partly glazed door/window shutter. • Practice drawing cross section of Load bearing wall showing different components. • Practice drawing Plan, Elevation, section and site plan of one roomed building. • Practice drawing Plan, Elevation, section and site plan of

	2BHK building. • Practice drawing Double line diagram of primary school building. • Practice drawing Plan of Rural Hospital. • Practice drawing typical floor Plan of Apartment **4.0 Preparation of 3-D drawings using CAD Software** • Practice 3D commands. – View commands – solids command – solid editing/modify commands. • Draw 3-D view of different simple objects. • Draw 3D view of Isolated Column footing. • Draw 3D view of wall foundation. • Draw Single roomed building in 3D. • Draw double roomed building in 3D.

KEY competencies to be achieved by the student

S.NO.	Experiment Title	Key Competency
1.	Introduction to computer	• Open/close CAD program • Understands CAD Graphic User Interface(GUI) and various toolbars
2	Practice on CAD software Geometric Constructions	• Practices the methods of selecting/entering commands • Sets the limits of the drawing • Learns Draw commands • Learns Modify commands • Learns Edit commands • Learns View commands • Learns Hatch commands • Learns Dimensioning Commands • Draws simple geometrical shapes like circles, tangents
3	Preparation of 2-D drawings using CAD Software	• Draws 2-D drawings • Practice conventional signs used in civil engineering. • Draws elevation of panelled door partly panelled and partly glazed door/window shutter. • Draws cross section of Load bearing wall showing different components. • Draws Plan, Elevation, section and site plan of one roomed building.

		• Draws Plan, Elevation, section and site plan of 2BHK building. • Draws Double line diagram of primary school building. • Draws Plan of Rural Hospital. • Draws typical floor Plan of Apartment
4	Preparation of 3-D drawings using CAD software	• Learns 3-D commands • Draws simple 3-D elements • Draws 3-D views of Isolated Column footing • Draws 3-D views of wall foundation • Draws 3-D Views Single roomed and double roomed building in 3D

PO-CO MAPPING:

Course Code : C-307	**Course Title: CAD PRACTICE-I Number of COs: 04**				**No. of Periods: 60**
POs	**Mapped with CO No.**	**CO Periods addressing PO in Column 1**		**Level (1,2,3)**	**Remarks**
		No	**%**		
PO1	CO1, CO2, CO3, CO4	23	26	2	>40% Level 3 (Highly Addressed)
PO2	CO1, CO2, CO3, CO4	10	11	1	
PO3	CO1, CO2, CO3, CO4	10	11	1	25% to 40% Level 2 (Moderately Addressed)
PO4	CO1, CO2, CO3, CO4	36	40	3	
PO5	CO1, CO2, CO3, CO4	6	7	1	5% to 25% Level 1 (Low Addressed)
PO6					
PO7	CO1, CO2, CO3, CO4	5	5	1	<5% Not Addressed

CO-PO MAPPING:

CO No.	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO 3**
CO1	2	3	3	2	3		2	2	2	3
CO2	2	3	2	3	3		2	2	2	3
CO3	3	2	2	3	2		2	2	2	3
CO4	2	2	2	2	2		2	2	2	3
Average	2.25	2.5	2.25	2.5	2.5		2	2	2	3

Note: The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits ..etc.

COURSE CONTENT

1.0 Introduction to computer aided drafting (CAD)

a) Computer graphics
b) Definition of CAD
c) Applications of CAD
d) Advantages of CAD
e) Introduction to CAD as drafting package

2.0 Practice on CAD

a) Study of drawing editor screen
b) List the methods to access CAD commands.
c) Practice of setting up of drawing area using utility commands, and using setting commands.
d) Practice entity draw commands.
e) Draw the given geometrical figures using draw commands.
f) Practice of Modify commands.
g) Practice of construct commands.
h) Practice of edit commands
i) Practice of view commands.
j) Practice of Hatch commands.
k) Practice of insert commands.
l) Dimension the figures using dimensioning commands.
m) Practice of Print/Plot commands
n) Divide a line into number of segments.
o) Draw an external/internal common tangent for two given circles of same/different radii.
p) Draw external/internal arcs for two given circles of same/different radii.
q) Construct ellipse, parabola, hyperbola, cycloid, and helix.

3.0 Preparation of 2-D drawings using CAD Software

Draw conventional signs, symbols used in civil engineering drawing.

a) Draw the elevation of fully panelled door, partly glazed and partly panelled door/window shutter.
b) Draw the section of a load bearing wall.
c) Prepare Building Drawing – One roomed building with site plan.
d) Prepare Building Drawing – 2BHK building with site plan.
e) Prepare plan of primary school Building.
f) Prepare Plan of Rural Hospital building.
g) Prepare a typical floor plan of Apartment consisting of G+5 floors.

4.0 Preparation of 3-D drawings using CAD Software

a) Practice 3D commands. – View commands – solids command – solid editing/modify commands.
b) Draw 3-D view of different simple objects.
c) Draw 3D view of Isolated Column footing.
d) Draw 3D view of wall foundation.
e) Draw Single roomed building in 3D.
f) Draw double roomed building in 3D.

REFERENCE BOOKS:

1. Drafting and Design (Engineering Drawing Using Manual and CAD Techniques), Kick lighter & Brown – Goodheart-Willcox Publisher

SURVEYING-II PRACTICE & PLOTTING

Course Code	Course Title	No. of Periods per Week	Total No. of Periods	Marks for Formative Assessment	Marks for Summative Assessment
C-308	SURVEYING-II PRACTICE & PLOTTING	04	60	40 (30 for class exercises + 10 for Survey camp)	60

S.No.	Major Topics	No. of Periods	COs Mapped
1.	Theodolite Survey	20	CO1
2.	Trigonometric Levelling	8	CO2
3.	Tacheometry	12	CO3
4.	Curves	12	CO4
5.	Plotting	8	CO1,CO2,CO3,CO4
	Total	**60**	
6	A Survey camp, immediately after completion of all exercises, shall be conducted for 4 days during 6 AM to 12 noon & 2PM to 5 PM on each day followed by one day break and 2 days of plotting from 9AM to 5 PM, with one hour lunch break. (25% of total sessional marks shall be allocated to this activity. The skills learnt during class exercises during I year & III semester shall be demonstrated in a simulated field like situation and shall be assessed appropriately)	7 days (Additional instructional duration & NOT to be included in the above 60 periods)	CO1,CO2,CO3,CO4

COURSE OBJECTIVES:

Upon completion of the Course, the student shall be able to		
Course Objectives	1	Develop knowledge about surveying instruments & methods adopted to carry out Field Survey with a professional approach.

	2	Develop skills in students in using Theodolite and curve setting.

COURSE OUTCOMES:

Course Outcomes	CO1	C-308.1	Apply the knowledge of Theodolite in different operations in civil engineering projects and to plot from field data.
	CO2	C-308.2	Apply the principles of Trigonometrical Levelling and computation of distance and elevation for different conditions and to plot from field data.
	CO3	C-308.3	Find the constants of Tacheometer and apply principles of Tacheometry and compute the distances and elevations for different conditions.
	CO4	C-308.4	Compute the elements of Simple curve and sets the Simple Curve by using different methods and to plot from field data.

LEARNING OUTCOMES:

LEARNING OUTCOMES	**1.0 Theodolite Surveying** • Identify the component parts of a theodolite • Perform temporary adjustment of theodolite. • Measure horizontal angle by repetition method and record the observations in the field book • Measure horizontal angles by reiteration methodand record the observations in the field book • Measure Vertical angles and record the observations in the field book • Measure the horizontal distance between two inaccessible points using theodolite • Measure bearing of a survey line • Conduct (i) Theodolite traversing (closed) (ii) Compute latitudes and departures and (iii)Calculate the area of traverse **2.0 Trigonometric Levelling** • Determine the Horizontal and Vertical Distance of an object whose base is accessible

	• Determine the Horizontal and Vertical Distance of an object whose base is inaccessible and the two instrument stations and the object in the same vertical plane • Determine the Horizontal and Vertical Distance of an object whose base is inaccessible and the two instrument stations and the object are not in the same vertical plane **3.0 Tacheometry** • Determine the Tacheometric constants 'K' and 'C'. • Determine Horizontal Distance and Elevation by principle of stadia Tacheometry. **4.0 Curves** • Sets out Simple Curve using Chain and Tape. • Sets out Simple Curve using One Theodolite. **5.0 Plotting** • Measure the horizontal distance between two inaccessible points by plotting the data observed in theodolite survey • Plot the closed traverse of theodolite, distribute the closing error by Bowditch / transit rule • Calculate the area of traverse from the traverse Plotting • Plot the Simple curve after setting out inthe field

PO-CO Mapping:

Course Code: C-308	**Course Title: SURVEYING –II PRACTICE & PLOTTING** **No of COs : 4**				**No. Of periods: 60**
POs	**Mapped with CO No**	**CO Periods Addressing PO in Col 1**		**Level (1,2,3)**	**Remarks**
		No	**%**		
1	CO1, CO2, CO3,	5	8.3	1	>40% Level.3

	CO4				(Highly addressed) 25% - 40% Level.2 (Moderately addressed) 5% - 25% Level.1 (Low addressed) <5% Not addressed
2	CO1, CO2, CO3, CO4	15	25	2	
3	CO1, CO2, CO3, CO4	25	41.7	3	
4	CO1, CO2, CO3, CO4	6	10	1	
5	CO1, CO2, CO3, CO4	5	8.3	1	
6	CO1, CO2, CO3, CO4	4	6.7	1	
7					

CO-PO Mapping:

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	2		3	3	3
CO2	2	3	2	2	2	2		3	3	3
CO3	3	2	3	3	3	3		3	3	3
CO4	3	2	2	2	3	3		3	3	3
Average	2.5	2.25	2.25	2.25	2.5	2.5		3	3	3

Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz

(vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc

COURSE CONTENT:

1.0 Theodolite surveying

a) Identification of the component parts of a theodolite
b) Performing temporary adjustment of theodolite.
c) Measurement of horizontal angle by repetition method and record the observations in the field book
d) Measurement of horizontal angles by reiteration method and record the observations in the field book
e) Measurement ofVertical angles and record the observations in the field book

f) Measurement ofthe horizontal distance between two inaccessible points using theodolite
g) Measurement ofbearing of a survey line
h) Conducting (i) Theodolite traversing (closed) (ii) Compute latitudes and departures and (iii) Calculate the area of traverse

2.0 Trigonometric Levelling

a) Determination of the Horizontal and Vertical Distance of an object whose base is accessible
b) Determination of the Horizontal and Vertical Distance of an object whose base is inaccessible and the two instrument stations and the object in the same vertical plane
c) Determination of the Horizontal and Vertical Distance of an object whose base is inaccessible and the two instrument stations and the object are not in the same vertical plane

3.0 Tacheometry

a) Determination of Constants of TacheometerDetermination of Distance and Reduced Level of Top an
b) Determination of Horizontal distance and elevation by stadia Tacheometry.

4.0 Curves

a) Setting out a simple curve by chain and tape method.
b) Setting out a simple curve by one Theodolite

5.0 Plotting

a) Measurement of horizontal distance between two inaccessible points by plotting the data observed in theodolite survey
b) Plot the closed traverse of theodolite, distributing the closing error by Bowditch / transit rule and calculate the area of traverse
c) Plot the Simple curve after setting out inthe field

KEY competencies to be achieved by the student

S.No.	Experiment Title	Key Competency
1	Field Exercises in Theodolite Surveying Ex 1.1 Ex 1.2 Ex 1.3	• Identify the component parts of a theodolite, Perform temporary adjustments of theodolite. • Measure horizontal angles. • Record the observations in the field

	Ex 1.4 Ex 1.5 Ex 1.6 Ex.1.7 Ex.1.8 Ex 1.9	book. • Measure horizontal angle by repetition method. • Measure horizontal angles by reiteration method. • Measure Vertical angles. • Measure the horizontal distance between two inaccessible points using theodolite. • Measure bearing of a survey line. • Conduct theodolite traversing (closed), Compute latitudes and departures, Calculate the area of traverse.
2	Field Exercises in Trigonometric levelling Ex 1.1 Ex 1.2 Ex 1.3	• Determine the Horizontal and Vertical Distance of an object whose base is accessible • Determine the Horizontal and Vertical Distance of an object whose base is inaccessible when the two instrument stations and the object are in the same vertical plane • Determine the Horizontal and Vertical Distance of an object whose base is inaccessible when the two instrument stations and the object are not in the same vertical plane
3	Field Exercises in Tacheometric Survey Ex 1.1 Ex 1.2	• Determine the Tacheometric constants 'K' and 'C' • Determine Horizontal Distance and Elevation by principle of stadia tacheometry
4	Field Exercises in Curves	• Sets out Simple Curve using Chain and

	Ex 1.1 Ex 1.2	Tape. • Sets out Simple Curve using One Theodolite.

MATERIAL TESTING PRACTICE

Course code	Course title	No. of period/week	Total no. of periods	Marks for Formative Assessment	Marks for Summative Assessment
C-309	Material Testing Practice	03	45	40	60

S.No.	Topics	No. of periods	COs Mapped
1	Tests on bricks	12	CO1,CO2,CO3,CO4,CO5
2	Tests on Cement	12	CO1,CO2,CO3,CO4,CO5
3	Tests on Aggregates	15	CO1,CO2,CO3,CO4,CO5
4	Tests on metals	06	CO1,CO2,CO3,CO4,CO5
	Total	45	

COURSE OBJECTIVES:

Upon completion of the course, the student shall be able to		
Course objectives	(i)	Familiarize with the knowledge of different materials, tools used in Material Testing Lab.
	(ii)	Use various basic implements used in testing of various Civil Engineering construction materials.
	(iii)	Know the etiquette of working with the fellow work force
	(iv)	Reinforce theoretical concepts by conducting relevant experiments/exercises.

COURSE OUTCOMES:

Course Outcomes	CO1	C-309.1	Demonstrate the skill of planning and organising experimental set up for conducting various tests on Civil Engineering construction materials
	CO2	C-309.2	Perform precise operations/tasks with Engineering equipment/instrument used for testing of different Civil Engineering construction materials
	CO3	C-309.3	Observe various parameters, their variations and graphically represent the same
	CO4	C-309.4	Analyse the experimental results to draw inferences, to make recommendations
	CO5	C-309.5	Practice ethics & etiquette while working in a group and display professionalism while communicating as a member and leading group.

LEARNING OUTCOMES	**1.0 Tests on bricks** **(a) Water absorption test on bricks** • Using of balance to weigh bricks and recording its weight. • Placing the specimen/ bricks in an oven at const. temperature. • Placing the end of the bricks in the dish, the depth of immersion in water being 25 mm. • Giving identification marks to bricks. • Immersing the bricks at a given temperature. • Wiping out water traces. • Placing the whole arrangement in a warm (for example,20 to 30°C) well ventilated room • Heating the specimen/ bricks in an oven at constant temperature. • Calculating % of water absorption. • Examining the bricks for efflorescence after the second evaporation and report the results. **(b) Crushing Strength test on bricks** • Operation of compression Testing machine /UTM. • Placing of bricks in CTM. • Applying of load gradually at the rate of $14N/mm^2/min$ Switching off the CTM. • Taking adequate no of bricks randomly. • Cleaning the surface of bricks. • Immersing the bricks in clean water tub. • Wiping off the surface of bricks with cloth after taking from water tub. • Applying CM 1:1 on the rough surfaces and filling up the frog with prepared CM. • Storing of plastered bricks under jute bags for 24 hours and immersing in clean water for 3days. • Wiping off surplus water after removing from clean water. • Preparing 1:1 cement mortar. • Applying the load gradually at the rate of 14 N/mm^2 per minute till failure occurs. • Recording the load at failure(crushing) • Tabulating the observations.

	• Calculating the average crushing strength. • **2.0 Tests on cement** **(a) Fineness Test on cement** • Selecting the required IS sieve No.9. • Weighing cement. • Sieving of cement. • Weighing of residue after sieving • Calculating % of residue of cement left on the pan. **(b) Normal Consistency Test on Cement** • Weighing of cement. • Transferring of cement into non-absorbent tray. • Using of stopwatch. • Measuring the required % of water. • Reading of Vicat's scale/noting down the plunger penetration and recording. • Mixing cement with water and transferring the paste into mould within gauge time. • Releasing of Vicat's plunger to penetrate into the paste. • Reading of Vicat's scale/noting down the plunger penetration and recording. • Reading of Vicat's scale/noting down the plunger penetration and recording. • Repeating the process varying % of water and noting the penetration of plunger from the bottom of the mould till the penetration value is between 5-7mm. **(c) Setting Time Test on cement** • Weighing of cement. • Transferring cement into non-absorbent tray. • Using of stopwatch. • Measuring the required % of water • Mixing cement with water and transferring the paste into mould within gauge time. • Releasing of Vicat's needle to penetrate into the paste • Reading of Vicat's scale/noting down the needle penetration and recording. • Repeating the procedure until the needle, when brought in

	contact with the cement block and released, fails to pierce the block between 5-7 mm measured from the bottom of the mould. **(d) Compressive Strength of cement** • Using of stopwatch. • Operating the vibrating machine for uniform compaction • Operating the compression testing machine • Transferring the cement into non-absorbent tray. • Mixing cement with water and transferring the paste into mould within gauge time. • Filling of mixed cement mortar into standard mould • Weighing of cement. • Mixing of 3 grades of Ennore sand. • Measuring of water (P/5 +3.5) % of combined weight of cement and sand. • Reading the compressive strength of cubes and recording **3.0 Tests on Aggregates** **(a) Water absorption test on sand** • Taking appropriate quantity of fine aggregate (sand) and clean it thoroughly by washing it thorough 75μ sieve till the fine dust is fully removed. • Finding weight of sand in pycnometer and pouring distilled water till sand in inundated. Cleaning the pycnometer on its outside surface and finding its weight after 24 hours saturation and let the weight be "A". • Emptying the pycnometer and filling it with distilled water only. Taking its weight "B". • Cleaning the aggregate with soft clothes until the aggregate become saturated surface dry and let its weight be "C". • Keeping the aggregate in oven for drying at a temperature of 110oc for period of 24hours. • Removing the aggregate from the oven, cooling to room temperature in the air tight desiccators and let the weight be "D" • Repeating the entire procedure for second sample also. **(b) Test on Bulking of sand**

	• Placing of sand in cylindrical container. • Measuring water using graduated glass jar. • Measuring Initial volume, Final volume of sand and volume of water. • Uniform mixing of water and sand. • Transferring the mixed sand from pan into measuring jar carefully. • Converting percentage of water into volume of water. • Calculating accurately the % of bulking for every equal increment of water added. • Drawing ordinary Graph with % of water added on X-axis and % of bulking on Y-axis. • Recording maximum percentage of bulking of sand corresponding to the percentage of water added from the curve of the Graph, record. • Calculating the volume of sand required taking into consideration the bulkage. **(c) Test on determination of bulk density and percentage of voids in Coarse and Fine aggregate** • Using of balance and recording weight. • Measuring the volumes of fine and coarse aggregate using cylindrical metal measure in loose and compacted states. • Weighing of cylindrical metal measures. • Weighing of cylindrical metal measures. • Tamping the aggregate in 25 strokes with tamping rod. • Calculating of bulk density of coarse and fine aggregates both in loose and completed states. **(d) Sieve analysis of coarse and fine aggregates** • Using of balance to weigh coarse and fine aggregates and recording their weight. • Arranging the set of sieves used for sieve analysis of coarse aggregate. • Arranging the set of sieves used for sieve analysis of fine aggregate. • Sieving of coarse and fine aggregate on a machine or

	sieve shaker • Calculating the cumulative percentage weight retained for coarse and fine aggregate. • Calculating the fineness modulus of coarse and fine aggregates. **(e) Field method to determine fine silt in aggregate** • Measuring the sand by graduated cylinder/jar. • Measuring the amount of fines forming a separate layer. • Adding of correct quantity of water to sand. • Calculating the silt content. **4.0 Tests on metals** **(a) Tension test on mild steel rod** • Mounting the specimen in the grips of movable and fixed heads of UTM. • Adjusting the load points to zero, after jaws hold the specimen firmly. • Keeping left valve in open position and right valve closed position. • Switch off the instrument. Measuring the diameter of the rod. • Making specimen of convenient length. • Applying the load slowly and gradually. • Removing the specimen from the grips. • Marking the center point • Measuring the gauge length. • Keeping the left valve in closed position after completion of the experiment • Observing the load decreasing and neck formation. • Noting the yield point, ultimate load and breaking point. • Plot the stress and strain graph **(c) Hardness test on metals** • Keeping the specimen ready for testing • Setting of dial to zero • Identifying Ball and diamond indenters • Identifying A, B, and C scale • Applying minor load • Reading of hardness number using microscope **(d) Izod/Charpy Impact test on metals**

	• Preparing the standard specimen and fixing the specimen in the position of anvil. • Clutching the striking hammer. • Adjusting the pointer. • Fixing the specimen in the position of anvil. • Adjusting the pointer. • Releasing pendulum to strike the specimen by taking safety precaution • Preparing the standard specimen • Recording down the reading by observing the appropriate scale **(e) Deflection test on beam** • Operating UTM. • Fixing and reading of dial gauge • Placing of specimen over the brackets centrally. • Selection of load range for the test. • Adjusting the load gauge and deflectometer to zero. • Applying of load at the rate of 2.5 mm per minute. • Noting down the deflection for each increment of load. • Drawing of graph between load vs deflection • Calculating of Young's modulus from the graph

PO-CO Mapping:

Course Code : C-309	**Course Title: Material Testing Practice**	**Number of Course Outcomes: 05**			**No. of Periods: 45**
POs	**Mapped with CO No.**	**CO Periods addressing PO in Column 1**		**Level (1,2,3)**	**Remarks**
		No	**%**		
PO1	CO1, CO3, CO4	13	29	2	> 40% Level 3 Highly addressed
PO2	CO1,CO3, CO4	12	27	2	
PO3	CO1, CO3, CO4	12	27	2	25% to 40% Level 2 Moderately addressed
PO4	CO2	4	8.5	1	
PO5	CO5	4	8.5	1	5 to 25% Level 1 Low addressed
PO6					
PO7					< 5% Not addressed

CO-PO Mapping:

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2	2					2	3	3
CO2				3				2	3	2
CO3	2	3	2					2	3	2
CO4	2	3	3					2	3	2
CO5					2			2	3	3
Average	2	2.7	2.3	3	2			2	3	2.4

Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz

(vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc

KEY Competencies to be achieved by the student

S.No	Experiment Title	Competency	Key Competency
1	Water Absorption on bricks	Taking weight of dry bricks and wet bricks	
2	Crushing strength test on bricks	1. Preparation of 1:1 cement mortar and application cement mortar over top and bottom faces of brick 2. Application of load gradually at the rate 14 N/mm^2 per minute till failure a occurs 3. Recording the load at FAILURE	Preparation of 1:1 cement mortar Application of load gradually at the rate 14 N/mm^2 per minute till failure a occurs
3	Fineness test on cement	Taking weight of cement sample and its residue	
4	Normal consistency test on cement	1. Measurement of required percentage of water to cement accurately 2. Preparation of sample in the mould 3. Reading of Vicat's	Preparation of sample in the mould Reading of Vicat's scale/noting down the plunger penetration

		scale/noting down the plunger penetration	
5	Setting times of cement	1. Measurement of required percentage of water to cement accurately 2. Preparation of sample in the mould 3. Reading of Vicat's scale/noting down the needle penetration 4. Recording time at required needle penetration	Preparation of sample in the mould Reading of Vicat's scale/noting down the needle penetration
6	Compressive strength test on cement	1. Taking weights of different grades of standard sand and cement accurately 2. Addition of required percentage of water to cement accurately 3. Application of load at required rate and recording of load at failure accurately	Application of load at required rate and recording of load at failure accurately
7	Water absorption of sand	Accurate weighing of dry sand and wet sand	
8	Bulking of sand	1. Measuring of sand and water accurately 2. Addition of water to sand in accurate increments 3. Measuring of increasing in volume of sand	Measuring of increasing in volume of sand
9	Determination of necessary adjustment for bulking of fine aggregate by field method	Measurement of volume of sand accurately	--
10	Bulk density and Percentage of voids in coarse and fine	1. Taking of weight of cylindrical metal measure accurately	Taking weight of aggregate and containers

	aggregates	2. Calculating of bulk density of coarse and fine aggregates both in loose and compacted states 3. Taking weight of aggregate and containers	
11	Sieve analysis of coarse and fine aggregate	1. Correct arrangement of sieves used for the sieve analysis of fine or coarse aggregate 2. Weighing of residue in each sieve accurately	Correct arrangement of sieves used for the sieve analysis of fine or coarse aggregate
12	Field method of determining fine silt in aggregate	1. Measuring sand by graduated cylinder accurately 2. Measuring correct quantity of water to be added to sand	--
13	Tension test on mild steel rod	1. Marking of gauge length on the MS Rod 2. Fixing the specimen correctly in between jaws 3. Application of load at required rate carefully 4. Measuring the load at failure accurately	Fixing the specimen correctly in between jaws Application of load at required rate carefully
14	Torsion test on mild steel rod	1. Measurement of length and diameter of specimen accurately 2. Application of load accurately 3. Measuring the angle of rotation accurately	Application of load accurately Measuring the angle of rotation accurately
15	Brinell/Rockwell	1. Placing of specimen at exact position 2. Application and release of load at required rate	--
16	Izod/Charpy test on mild steel/brass	1. Preparation of standard specimen and fixing the	Preparation of standard specimen and fixing the

		specimen in the right position of anvil	specimen in the right position of anvil
		2. Recording down the reading by observing the appropriate scale	
17	Deflection test on beams	1. Measuring the dimensions of specimen accurately	Measurement of deflection accurately
		2. Application of load at exact point of application	
		3. Measurement of deflection accurately	
		1. Measurement of deflection of springs	

COURSE CONTENT

1. Tests on Bricks

Water absorption - Crushing strength

2. Tests on Cement

Fineness test - Normal consistency test - Setting times of cement - Compressive strength of cement.

3. Tests on Aggregates

Water absorption of Sand - Bulking of Sand - To determine necessary adjustment for bulking of fine aggregate by Field method - Bulk density and Percentage of voids in Coarse and fine aggregates - Sieve analysis of coarse and fine aggregates - Field method to determine fine silt in aggregate.

4. Tests on Metals

Tension test on mild steel rod - Torsion test on mild steel rod - Brinell/Rockwel hardness test on steel and Brass with different surface finish - Izod/Charpy tests on mild steel/brass - Deflection Test on beam (Steel beam or wooden beam)

REFERENCE BOOKS:

1. Laboratory manual of strength of materials and soil mechanics, SBTET, A.P.

HYDRAULICS PRACTICE

Course Code	Course Title	No. of Periods per Week	Total No. of Periods	Marks for Formative Assessment	Marks for Summative Assessment
C-310	Hydraulics Practice	03	45	40	60

S.No	Major Topics	No. of Periods	COs Mapped
1	Determination of Hydraulic Coefficients / factors / Constants / Verification of Principles / Laws	36	CO1, CO2, CO3, CO4
2	Study on Hydraulic Machines	09	CO5
	Total	**45**	

COURSE OBJECTIVES:

Upon completion of the Course, the student shall be able to		
Course Objectives	1	Understand the principles of Hydraulics in flow measurements and Pumps & Turbines.
	2	Critically observe/examine and Measure the discharges through flow measuring devices.
	3	To know the etiquette of working with the fellow work force.
	4	To reinforce theoretical concepts by conducting relevant experiments/exercises.

COURSE OUTCOMES:

Course Outcomes	CO1	C-310.1	Conduct Experiment to determine Hydraulic Coefficients of Orifices, Mouthpieces and notches.
	CO2	C-310.2	Conduct a test employing Bernoulli's theorem (i) to observe head variation (ii) To determine discharges by varying the head.
	CO3	C-310.3	Conduct Experiment to determine flow rates, pressure changes, and major head loss for flow through pipes.
	CO4	C-310.4	Conduct open channel flow to measure chezy's constant.
	CO5	C-310.5	Conduct relevant test to evaluate the performance of Hydraulic machines

LEARNING OUTCOMES:

LEARNING OUTCOMES	**1.1 Determine coefficient of discharge of a small orifice by constant head method and variable head method.** • Measure dimensions of collecting tank using meter scale and record its dimensions. • Measure the diameter of Orifice using Vernier calipers. • Priming of motor is to be done before switching on. • Operate outlet valve of collecting tank for taking T & H for calculation of Qa, without overflowing it. • Measure the time required (T) to rise the water level to a desired height (H) after closing outlet valve in the colleting tank. • Maintain constant head in supply tank. • Preparation of graph with the observed values and adding a trend line, measuring slope of it and finding out the Cd from graph. **1.2Determine coefficient of discharge of a small orifice by variable head method.** • Measure the diameter of Orifice Using Vernier calipers • Priming of motor is to be done before switching on • Measure dimensions of orifice tank • Measure the diameter of Orifice using Vernier calipers • Switch on the Pump (If pump is not working, go for Priming) • Record the time taken to descend the water level in the orifice tank from head $H_1$to head H_2. **1.3 Determine the hydraulic coefficients of an orifice.** • Switching on the motor after priming • Operation of different valves • Measure diameter of Orifice Using Vernier callipers • Measure the internal dimensions of the tank. • Operation of stop watch • Operation of sliding Vernier scale • Reading a piezometer values without parallax by maintaining the constant head • Note the time for collecting specified quantity of water and subsequent valve operations. • Reading on piezometer has to be taken corresponding to lower meniscus level. • Identify the location of Vena-Contracta. • Note down the Initial co-ordinates taken at vena-contracta and

	final co-ordinates taken at any random point on jet **1.4 Determine coefficient of discharge of a mouthpiece by constant head method.** • Use meter scale to measure dimensions of collecting tank and recording its dimensions. • Use vernier calipers to know the diameter of mouthpiece • Note the time elapsed for collecting specified quantity of water using stop watch. • Operate outlet valve to know the rise of water in collecting tank. • Operate inlet valve to maintain constant head • Measure time required to constant rise in collecting tank after Closing outlet valve. • Record values accurately. • Calculate C_d for mouth piece. • Plot the graph with specific parameters. • Compare graph with standard values. **1.5 Determine coefficient of discharge of a rectangular notch.** • Measure the size of Notch and collecting tank • Fix hook gauge with sharp edge needle in Notch tank. • Note the least count of point gauge • Allow the water into notch tank up to crest level of notch and record the point gauge reading. • Control Valves to regulate the flow of water to maintain constant depth over crest of notch. • Measure the head over Notch. • Measure the depth of flow. • Note the time using the stop watch for 10cm rise of water in collecting tank. • Note the Readings of Piezometer at collecting tank without parallax error. **1.6 Determine coefficient of discharge of a triangular notch.** • Measure the size of Notch and collecting tank • Fix hook gauge with sharp edge needle in Notch tank. • Note the least count of point gauge • Allow the water into notch tank up to crest level of notch and record the point gauge reading. • Control Valves to regulate the flow of water to maintain constant depth over crest of notch

	• Measure the head over Notch. • Measure the depth of flow. • Note the time using the stop watch for 10cm rise of water in collecting tank. • Note the Readings of Piezometer at collecting tank without parallax error. **1.7 Verify Bernoulli's theorem.** • Priming operation is to be done before switching on the motor. • Stop watch reading. • Maintain constant head by operating appropriate valves. • Measurement of areas and piezometer reading at given sections without parallax. • Measure the dimensions of collecting tank. • Note down the time taken for 10 cm rise in collecting tank without parallax. • Calculate actual discharge. • Calculate velocity and velocity heads at various sections of piezometers. • Calculate and verify total heads at various sections. **1.8 Determine coefficient of discharge of a venturimeter.** • Operate the control valve for varying flow rate. • Check condition of valves for manometer, collecting tank, • venturimeter conduit or pipe. • Check for working of stop watch and Pump (If pump is not working go for Priming) • Release air bubbles in U tube manometer by using respective valves. • Release valves of collecting tank, noting the time taken for specific rise in water level in it. • Adjust control valve for required flow rate • Record readings of u tube manometer. • Calculate Cd of venturi meter. **1.9 Determine friction factor in pipe flow.** • Use Vernier callipers to determine diameter of the pipe. • Perform Priming of Centrifugal Pump. • Identify the points in the pipe to know the Pressure difference. • Regulate the flow in pipe to avoid air bubbles. • Operate Inlet Valve to Maintain Constant Head. • Operate Control valves for Reservoir and collecting tank. • Operate Control valves for Creating Pressure Difference between two points. • Take Differential Manometer reading. • Allow water to a measurement of 100mm rise in collecting

	tank. • Note the time elapsed for 100mm rise by stop watch in sec. **1.10 Determine Chezy's constant in open channel flow.** • Before starting the motor, priming should be done is necessary. • Operating valves to maintain steady flow. • Taking the water level reading using the gauge. • Read the piezometer reading without parallax error. • Stop watch operation. • Care should be taken to avoid overflow of the collecting tank. • Note down the slope of the channel. • Maintain steady flow. • Note the time taken for 10cm rise in the collecting tank • Head should be read carefully on the point gauge. • Calculate the values of chezy's constant for different discharges. **2.0 Tests on Hydraulic machines.** **2.1 Conduct performance test on a single stage Centrifugal pump** • State the Aim / apparatus /equipment required • Perform test and record observations • Identify the component parts of a reciprocating pump. • State the functions of each component. • State field applications. **2.2 Determine the efficiency of a Reciprocating pump** • State the Aim/apparatus/equipment required. • Perform test and record observations. • Identify the component parts of a reciprocating pump. • State the functions of each component. • State field applications and compare with Reciprocating pump. **2.3 Study on Hydraulic Turbines** • Identify the component parts of Pelton wheel, Francis or kaplan turbines. • State function of each component. • State field applications.

PO-CO Mapping:

Course Code: C-310	Course Title: HYDRAULICS PRACTICE No of COs : 5				No. of Periods: 45
POs	Mapped with CO No.	CO Periods addressing PO in Column 1		Level (1,2,3)	Remarks
		No	%		
PO1	CO1, CO2, CO3, CO4, CO5	10	22	1	> 40% Level 3 Highly addressed 25% to 40% Level 2 Moderately addressed 5 to 25% Level 1 Low addressed < 5% Not addressed
PO2	CO1, CO2, CO3, CO4, CO5	12	27	2	
PO3	CO1, CO2, CO3, CO4, CO5	7	15	1	
PO4	CO1, CO2, CO3	4	9	1	
PO5					
PO6	CO1, CO2, CO3, CO4, CO5	12	27	2	
PO7					

CO-PO Mapping:

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	2		3		1	3	2
CO2	3	3	2	2		3		1	3	2
CO3	3	3	2	2		3		1	3	2
CO4	3	3	2			3		1	3	2
CO5	3	3	2			3		1	3	2
Average	3.0	3.0	2.0	2.0		3.0		1	3	2

Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz

(vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc

COURSE CONTENT:

LIST OF EXPERIMENTS

I Determination of Hydraulic Coefficients/factors/Constant/Verification of Principles/ Laws

a. Determination of coefficient of discharge of a small orifice by constant head method
b. Determination of coefficient of discharge of a small orifice by variable head Method
c. Determination of Cc of an orifice by finding C_v and C_d.
d. Determination of coefficient of discharge of a mouthpiece by constant Head method.
e. Determination of coefficient of discharge of a triangular notch.
f. Determination of coefficient of discharge of a rectangular notch.
g. Determination of coefficient of discharge of a trapezoidal notch.
h. Verification of Bernoulli's theorem.
i. Determination of coefficient of a discharge of a venture meter.
j. Determination of friction factor in pipe flow.
k. Determination of Chezy's constant in open channel flow.

II Study of Fluid machines

a. Tests on reciprocating pump and centrifugal pump.
b. Study on turbines – Pelton / Francis / Kaplan.

KEY Competencies to be achieved by the student

S. No	Experiment Title	Competency	Key Competency
1	Coefficient of discharge of small orifice by constant head.	1)Regulate the flow 2)Operate stop clock accurately 3)Draw graph between Q vs $H^{1/2}$	1)Regulate the flow 2)Operate stop clock accurately 3)Draw graph between Q vs $H^{1/2}$
2.	Coefficient of discharge of small orifice by variable head	1)Note readings of head at intervals. 2)Operate stop clock accurately 3)Draw graph between Q vs $H^{1/2}$	
3	Hydraulic coefficients of orifice.	1)Regulate flow. 2)Note co-ordinate values and measure volume 3) Operate stop clock accurately 4)State the relation.	
4.	Coefficient of discharge of mouth piece by constant head.	1)Regulate the flow 2)Operate stop clock accurately 3)graph between Q vs $H^{1/2}$	
5.	Coefficient of discharge of rectangular notch.	1)Note readings of head 2)Operate stop clock accurately 3)Draw graph between Q vs $H^{3/2}$	1)Regulate the flow 2)Operate stop clock accurately
6.	Coefficient of discharge of triangular notch	1)Note readings of head 2)Operate stop clock accurately 3)Draw graph between Q vs $H^{5/2}$	1)Regulate the flow 2)Operate stop clock accurately
7	Verify Bernoulli's theorem	1)Note readings of head at various locations 2)Plot hydraulic gradient line and total energy line	Plot hydraulic gradient line and total energy line
8	Coefficient of discharge of venturimeter.	1)Note readings of head 2)Operate stop clock accurately 3)Draw graph between Q vs $H^{1/2}$	1)Regulate the flow 2)Operate stop clock accurately
9	Friction factor in pipe flow.	1)Note readings of head 2)Observe the significance of friction factor of pipe flow.	Observe the significance of friction factor of pipe flow
10	Chezy's constant	1)Note readings of head 2)Observe the significance in design of section of open channel	Observe the significance in design of section of open channel

IV
SEMESTER

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTION AND MODEL BLUE PRINT FOR EVALUATION
CURRICULUM-2023

FOURTH SEMESTER

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods Per Year	Scheme Of Examination			
		Theory	Practical		Duration (hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY								
C-401	Construction Technology & Valuation	4		60	3	20	80	100
C-402	Design and Detailing of R.C.Structures	5		75	3	20	80	100
C-403	Construction Practice	4		60	3	20	80	100
C-404	Transportation Engineering	4		60	3	20	80	100
C-405	Irrigation Engineering	4		60	3	20	80	100
PRACTICAL								
C-406	Civil Engineering Drawing-II		6	90	3	40	60	100
C-407	Concrete & Soil Testing Practice		3	45	3	40	60	100
C-408	Communication Skills		3	45	3	40	60	100
C-409	Surveying-III Practice		3	45	3	40	60	100
C-410	CAD Practice-II		3	45	3	40	60	100
	Student Centric Learning Activities		3	45				
	Total	**21**	**21**	**630**		**300**	**700**	**1000**

[Note: C-408 is Common with all Branches]

CONSTRUCTION TECHNOLOGY AND VALUATION

Course code	Course title	No. of period /week	Total no. of periods	Marks for Formative Assessment	Marks for Summative Assessment
C-401	**Construction Technology and Valuation**	04	60	20	80

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. of Periods	Weightage of marks	No. of Short Answer Questions	No. of Essay Questions	COs Mapped
1.	Concrete Technology	15	26	2	2	CO1
2.	Construction Machinery and Equipment	10	16	2	1	CO2
3.	Building Services	10	26	2	2	CO3
4.	Earthquake Resistant Structures	10	16	2	1	CO4
5.	Building Valuation	15	26	2	2	CO5
	Total	**60**	110	10	8	

COURSEOBJECTIVES:

Upon completion of the course the student shall be able to		
Course Objectives	(i)	Familiarize with basic concepts of Concrete Technology and Understand the various Machinery and Equipment used in Construction and Familiarize the concepts of various services in a Building.
	(ii)	Understands the basic concepts of Earth quake Resistant Structures and its related codal provisions.
	(iii)	Understands the concepts of Valuation and fixes the rent of a building.

COURSEOUTCOMES (COs):

Course Outcomes	CO1	C-401.1	Explain basic concepts of Concrete Technology.
	CO2	C-401.2	Understands different Construction Machinery and Equipment used in Construction.
	CO3	C-401.3	Understands the different services in a Building.
	CO4	C-401.4	Understands the Earth quake Structures and Ductile Detailing as per codal provisions
	CO5	C-401.5	Understands the basic concepts of Valuation and fixes the rent of a building.

LEARNINGOUTCOMES:

1. Concrete Technology	1.1. State the ingredients of Concrete. 1.2. Define 1.Workabilityand2.Water/Cement ratio 1.3. Explain the relation between strength of concrete, workability and water/cement ratio 1.4. Understand 'Grades' of concrete. 1.5. state the grades of concrete recommended for different types of works. 1.6. Differentiate 'Normal strength concrete and High strength concrete' 1.7. Differentiate between 'Ordinary Concrete and Controlled Concrete' 1.8. State the functions of Ad mixtures in concrete 1.9. List out different ad mixtures being used.

	1.10. State the Principles of Concrete Mix Design. 1.11. State the factors affecting variability of concrete strength. 1.12. Explain the procedure of Concrete Mix design using IS Code method 1.13. Understand the following special concretes 1. Fiber Reinforced Concrete, 2. Fal-G-Concrete, 3. Light weight concrete, 4. High density concrete, 5. Polymer concrete and 6. Self-compacting concrete 1.14. Understand concreting under special exposure conditions like 1. Under-water concreting, 2. Cold weather concreting, 3. Hot weather concreting and 4. Concreting in high rise buildings 1.15. Explain 'Micro concrete' and 'Shotcrete'. 1.16. State the need for Expansion and Construction joints in concrete structures. 1.17. Explain the method of providing various joints in RCC roofs.
2. Construction Machinery and Equipment	2.1. Understand the need for mechanization and construction activities 2.2. State different types of construction equipment with help of neat sketch 2.3. Explain the uses of different construction equipment 2.4. State the factors to be considered for the selection of type of construction equipment.
3. Building Services	3.1. Explain the hot water supply distribution using solar water heating system with of help of neat circuit diagram. 3.2. State the requirements of good lighting in building. 3.3. Define the terms 1. Glare and 2. Day light factor 3.4. State the precautions to be taken to avoid glare in building

	3.5. State the requirements of good electrical wiring. 3.6. List the power rating of different domestic electrical appliances. 3.7. List the different types of electrical wirings. 3.8. State the objectives of electrical earthing. 3.9. Explain the method of earthing 3.10. State the requirements of good ventilation. 3.11. Explain1.Naturalventilationand2.Artificialventilation. 3.12. State the functions of 1. Sunshades, 2. Louvers, 3. Sun breakers and 4. Blinds 3.13. State the principles of fire protection in buildings. 3.14. State the causes of fire. 3.15. Explain about firefighting. 3.16. State different fire detectors and fire extinguishers. 3.17. State different fire extinguishers 3.18. State different fire-resistant building materials. 3.19. Explain about air conditioning. 3.20. State different types of cooling systems.
4. Earthquake Resistant Structures	4.1. List causes seismic waves, basic terminology 4.2. Explain 1. Magnitude, 2. Intensity and 3. Energy release 4.3. Characteristics of earthquake 4.4. Understand basic terminology of earthquake 4.5. Explain seismic zoning 4.6. Explain seismic construction with brick stone masonry buildings as per codal provisions. 4.7. Explain seismic construction with stone masonry buildings as per codal provisions. 4.8. Understand seismic construction and detailing of R.C. buildings as per codal provisions.
5. Building Valuation	5.1. Define the terms: 1. Value and 2. Cost and price 5.2. State the need for valuation.

	5.3. Explain the following terms: 1. Depreciation, 2. Sinking fund, 3. Annuity and 4. Capitalized value 5.4. Lists different methods of valuation of buildings. 5.5. Explains different methods of valuation of buildings. 5.6. State methods of rent fixation of building. 5.7. Explain methods of rent fixation of building.

PO-CO MAPPING:

Course Code:C-401	**Course Title: Construction Technology and Valuation No of COs: 5**				**No. of periods: 60**
POs	**Mapped with CO No**	**CO Periods Addressing PO inCol1**		**Level(1, 2,3)**	**Remarks**
		Nos.	**%**		
PO1	CO1, CO2, CO3, CO4, CO5	14	23	1	>40% Level 3 (Highly Addressed)
PO2	CO3, CO4, CO5	03	5	0	
PO3	C04	01	2	0	25%to 40% Level 2(Moderately Addressed)
PO4	-	-	0	0	
PO5	C01, CO2, CO3, CO4, CO5	12	20	1	5% to 25% Level 1(Low Addressed)
PO6	C02	2	3	0	
PO7	C01, C02, C03, C04, CO5	28	47	3	<5%NotAddressed

CO-PO MAPPING:

COs / POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	2	-	-	-	2	-	3
CO2	1	-	-	-	2	2	3
CO3	2	1	-	-	1	-	3
CO4	1	1	1	-	1	-	3
CO5	1	1	-	-	2	-	3
Average	1.4	1	1	0	1.6	2	3

Note:ThegapsinCO-POmappingwillbemetbyoneormoreappropriateactivitiesfromthefollowing:

(i) Assignments(ii)Tutorials(iii)Seminars(iv)Guestlectures(v)Groupdiscussions (vi)Quiz(vii)Industrialvisits(viii)Techfests(ix)Miniprojectworks(x)Libraryvisits...etc.

COURSECONTENT

1.0 ConcreteTechnology

Introduction–IngredientsofConcrete–PropertiesofConcrete–Workability - Factors influencing workability – Water / Cement Ratio – Relation betweenStrengthofconcreteandWater / CementRatio - CuringofConcrete - Methodofcuring - Grade of concrete - Controlled concrete and Ordinary Concrete - NormalstrengthconcreteandHighstrengthconcrete - Admixtures– Typesofadmixtures– Accelerators – Retarders – Plasticizers – Superplasticizers-Uses - Mixdesign–Factorsinfluencingmixdesign–MethodsofMixdesign–IS: 10262-2009methodofmixdesign-Special Concretes – fiber reinforced Concrete – Fal G-Concrete, highdensity Concrete, Light weight Concrete, polymer Concrete and micro-Concrete–SelfCompactingConcrete-Properties–uses.

Concretingunderspecialexposurecondition–coldweatherConcreting – hotweatherConcreting–underwaterconcreting–Shotcrete–Concretinginhighrisebuildings - Joints – Necessity of joints – Joints in RCC roofs – Expansion joint –Contractionjoint–Constructionjoint.

2.0 Constructionmachineryandequipment

NeedforuseofconstructionMachinery - Factorsaffectingselectionofequipment. Types–CrawlerandPneumatictyred - Excavation equipments – Tractors, Bulldozer, Grader, Scrapper, Shovel,Dragline,Clamshell,Dredgers–description – Uses - Compaction equipment – Rollers, tamping roller – Smooth wheeledroller – Pneumatic tyred rollers – Vibrating compactors – Description –uses - Haulingequipments–Trucks,Dumptrucks,Dumpers - Cranes–Towercranes - Conveyingequipments–Beltconveyors

3.0 BuildingServices

Hotwatersupplyusingsolarwaterheatingsystem - Lightingrequirementsinabuilding–daylightfactor–glare-Electrical services – Requirements of good electrical wiring – types ofelectricalwirings–earthing–methods - Ventilation–Requirementofgoodventilation–Naturaland Artificialventilation–purposeofsunshades,louvers,andblind - Air conditioning – Purpose – Air conditioning layout – Components –Types of cooling systems – Air coolers – Air conditioner – Centralized Airconditioner–SplittypeAirConditioner.

4.0 Earthquakeresistantstructures

Causesofseismicwaves–Magnitude,intensityandenergyrelease–basicterminology–Characteristicsof earthquake–seismiczoning - Seismicconstructionofbrickandstonemasonrybuildings–ProvisionsofIS: 4326 - SeismicconstructionofR.C.Buildings–DetailingasperProvisionsofIS:13920.

a. BuildingValuation

Definition – Value, Cost and Price, Scrap value, Salvage value, Marketvalue, Book value, sinking fund and its meaning – purpose of valuation – factorsgoverningvaluation - Depreciation–Sinkingfund–Annuity–

Capitalizedvalue - Methods of valuation – Land & building method, Development

method,Depreciationmethod,Rentalmethod,Capitalizationmethod,Profitmethod, Simpleproblemsoneachoftheabovemethod.

`Rent fixation – Rent fixation of building – principles of rent fixation byCPWD– Fairrentmethod–simpleproblems.

REFERENCEBOOKS

1. ConcreteTechnologybyMSShetty
2. BuildingTechnologyandvaluation TTTI,Chennai
3. HandbookonDesignofConcretemixesS.P.23
4. ValuationofRealPropertiesbyS.C. Rangwala

TABLESPECIFYINGTHESCOPEOFSYLLABUSTOBECOVEREDFORUNITTEST-I& II

UnitTest	**Learningoutcomesto becovered**
UnitTest-I	From1.1to 3.7
UnitTest-II	From 3.8to 5.7

DESIGN AND DETAILING OF R.C. STRUCTURES

Course code	Course title	No. of period/week	Total no. of periods	Marks for Formative Assessment	Marks for Summative Assessment
C-402	Design and Detailing of R.C. Structures	05	75	20	80

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. of Periods	Weightage of marks	No. of Short Answer Questions	No. of Essay Questions	COs Mapped
1.	Introduction to R.C.C and Principles of Working Stress Method	08	3	1	-	CO1
2.	Philosophy of Limit State Design	05	3	1	-	CO2
3.	Analysis and Design of Rectangular Beams	15	26	2	2	CO2
4.	Design of Slabs	12	26	2	2	CO2
5.	Analysis of T-beams	12	13	1	1	CO3
6.	Design of columns	12	23	1	2	CO4
7.	Design of footings	11	16	2	1	CO4
	Total	75	110	10	8	

COURSE OBJECTIVES:

Upon completion of the course the student shall be able to		
Course Objectives	(i)	Make student to be familiar with the principles of methods of design of R.C. Elements subjected to flexure, compression, shear and torsion.
	(ii)	Enable the student to design various R.C. Building Elements.

COURSE OUTCOMES:

Course Outcomes	CO1	C-402.1	Explain principles of Working stress design
	CO2	C-402.2	Design singly reinforced & doubly reinforced R.C.C rectangular beams and slabs using Limit state method
	CO3	C-402.3	Design T-beam& slabs using Limit state method.
	CO4	C-402.4	Design columns & footings using Limit state method

LEARNING OUTCOMES:

Learning Outcomes	**1.0 Introduction to R.C.C and Principles of Working Stress Method** 1.1 Differentiate Cement concrete and reinforced cement concrete. List the advantages and disadvantages of R.C.C. 1.2 List the material used in R.C.C. and their functions in R.C.C. State the reasons for using steel as reinforcement. 1.3 List the different codes used in R.C.C. List the Loads to be considered in the design of R.C. elements. 1.4 State the different grades of concrete and different permissible stresses in concrete (Working Stress Method) as per IS 456 – 2000. Differentiate the nominal mix concrete and design mix concrete. 1.5 Write the equations of tensile strength and modulus of elasticity of concrete as per IS 456 – 2000. State properties of concrete viz., Poisson's ratio, Creep, Shrinkage, Workability and Unit weight. 1.6 List different types of steel and their permissible stresses in steel (Working Stress Method) as per IS 456 – 2000. State modulus of elasticity and unit weight of steel. 1.7 State different methods of designing R.C. elements. 1.8 State the assumptions made in Working Stress Method as per IS 456

	– 2000. Define modular ratio. Write the equation of modular ratio in working stress method. Sketch the stress distribution and transformed area of R.C. section. 1.9 Define Effective depth, Neutral axis, Lever arm and Moment of resistance. Describe balanced section, under reinforced section and over reinforced sections with sketches. 1.10 Calculate Neutral axis, Lever arm and Moment of resistance for a singly reinforced rectangular beam. **2.0 Philosophy of Limit State Design** 2.1 Define Limit State. 2.2 State different limit states. 2.3 Distinguish 'strength' and 'service ability' limit states 2.4 List different IS: 456 – 2000 code provisions for Limit state method of design. 2.5 Define characteristic strength of materials and characteristic loads. 2.6 Differentiate Nominal Mix and Design Mix. 2.7 Explain the role of partial safety factors in limit state design. 2.8 Define Design strength of materials and Design loads. 2.9 State the assumptions made in the limit state design. 2.10 State the differences between the Working stress method and Limit state method of design of R.C. elements. **3.0 Analysis and Design of Rectangular Beams** 3.1 Sketch stress and strain diagrams for a singly reinforced rectangular beam indicating appropriate stress and strain values in compression zone and tension zone of the beam, also the strain value at the junction of parabolic and rectangular stress blocks. Calculate the depth of rectangular and parabolic stress blocks. 3.2 Calculate the total compressive force and total tensile force resisted by the singly reinforced rectangular beam. Calculate the depth of neutral axis from the equilibrium condition. Define lever arm. Write the equation for lever arm for a singly reinforced rectangular beam. 3.3 Explain – why the over reinforced sections are not recommended? Calculate the maximum depth of neutral axis. Calculate the limiting value of moment of resistance with respect to concrete and steel. Calculate the limiting percentage of steel. 3.4 State the general design requirements for beams in limit state design as per IS 456 – 2000 (Effective span, limiting stiffness, minimum tension reinforcement, maximum tension reinforcement, maximum compression reinforcement, spacing of main bars, Cover to reinforcement, side face reinforcement.) 3.5 Calculate the depth of neutral axis for a given section and decide whether the section is balanced or under reinforced or over reinforced and calculate the moment of resistance for the respective case. Calculate the area of steel for a given beam with given cross section and loading. 3.6 Design a singly reinforced beam as per IS 456 – 2000 for flexure only with the given grade of steel and concrete and check the designed

beam for deflection as per IS 456 – 2000.

3.7 Explain the effect of shear on beam. Explain the shear stress distribution across a homogeneous section and reinforced concrete section with sketches. Explain the design shear strength and maximum shear stress in different grades of concrete as per IS 456 – 2000. Explain the need for shear reinforcement and different forms of shear reinforcement provided in beams. Explain the critical section for shear.

3.8 Calculate the shear strength of concrete, shear resistance of vertical stirrups, shear resistance of bent up bars as per IS 456 – 2000. State the minimum shear reinforcement and maximum spacing of shear reinforcement as per IS 456 – 2000. Calculate the nominal shear stress, shear resisted by bent up bars and spacing of vertical stirrups.

3.9 Design the shear reinforcement for beams. Design a singly reinforced beam as per IS 456 – 2000 with the given grade of steel and concrete and check the designed beam for shear and deflection as per IS 456 – 2000 and design the shear reinforcement as per 456 – 2000.

3.10 State the situations which require doubly reinforced beams.

3.11 Determine the moment of resistance for a given doubly reinforced section (given d'/d – f_{sc} values).

3.12 Calculate the allowable working load on singly reinforced beam

3.13 Calculate the development length of bars in compression, tension, and the curtailment position for main tension bars. State the importance of anchorage values of reinforcement.

3.14 Design a singly/doubly reinforced simply supported rectangular beams for the given grades of materials, span and loading for flexure including shear design with the curtailment of reinforcements and check for the deflection using simplified approach of the code.

4.0 Design of Slabs

4.1 Distinguish one-way slabs and two way slabs.

4.2 List the types of slabs based on support conditions.

4.3 Explain the general design requirements of slabs as per IS 456 – 2000.

4.4 Explain the functions of distribution steel in slabs.

4.5 Sketch the general reinforcement details for a

1) One-way slab simply supported on two parallel sides
2) One-way slab simply supported on four sides
3) Two way simply supported slab
4) One-way continuous slab
5) Cantilever slab continuous over a support and

4.6 Explain the edge strip and middle strip of a two-way slab.

4.7 Sketch the general reinforcement details for a continuous two-way slab for its edge strip and middle strip using straight bars and bent up bars.

4.8 Design one-way slab for given grades of materials, loads and span

	for flexure and including shear check, check for deflection using stiffness criteria. 4.9 Explain Load distribution in two-way slabs. Design two-way slab with different end conditions for flexure including shear using B.M and S.F coefficients. Calculate the area of torsional reinforcement in the restrained slabs. Check the deflection using simplified approach of stiffness criteria. 4.10 Classify the stairs based on the structural behaviour or support condition. Sketch the detailing of reinforcement in stairs spanning longitudinally (Dog legged staircase only) **5.0 Analysis of T-beams** 5.1 Distinguish T- beam and L- beam. 5.2 List the advantages of a T- beam. 5.3 Write formula for effective width of flange of a T- beam and L- beam as per IS 456 – 2000. 5.4 Calculate the effective width of flange of an isolated T- beam as per IS 456 – 2000. 5.5 Describe the three cases of determining Neutral axis of T-beams with sketches and notations. 5.6 Calculate the depth of neutral axis and moment of resistance of the given Tee section using the expressions given in the code. 5.7 State the minimum and maximum reinforcement in T- beams as per 456 – 2000. **6.0 Design of columns** 6.1 Define a column/compression member. Differentiate among Column, Strut, Pedestal and Post 6.2 Explain the need for providing reinforcement in column. 6.3 State the effective length of column for different end conditions as per theory and as per code. 6.4 Classify the columns based on type of reinforcement, loading and slenderness ratio. 6.5 State the slenderness limits for column to avoid buckling of column. 6.6 State the minimum eccentricity of column. 6.7 Calculate the load carrying capacity of a short column with lateral ties and with helical reinforcement as per IS 456 – 2000. 6.8 Differentiate between short and long columns and understand their failure behaviour. 6.9 Explain the design requirements of columns as per IS 456 – 2000. 6.10 Design a Short Square, rectangular, circular column with lateral ties (subjected to axial load only). **7.0 Design of Footings** 7.1 Define Footing 7.2 State different types of Footings (Square/ Rectangular Isolated footings of Uniform/Tapered sections).

	7.3	State the Rankine's formula for minimum depth of foundation.
	7.4	State the code provisions for the design of R.C.C footings.
	7.5	Explain the procedure of checking the footing for one-way shear, two-way shear, bearing stress and for development length.
	7.6	Design isolated square footing of uniform thickness under a column for flexure only.

Note: Students may be encouraged to use design aids SP-16, SP-34 and SP-23 for design of slabs, beams for general practice. I.S.456 – 2000 is allowed in the Examination.

PO-CO Mapping:

Course Code : C-402	**Course Title: Design and Detailing of R.C. Structures** **No of COs : 4**				**No. of Periods: 75**
POs	**Mapped with CO No**	**CO Periods addressing PO in Column 1**		**Level (1,2,3)**	**Remarks**
		No	**%**		
PO1	CO1,CO2, CO3,	19	25.5	2	> 40% Level 3 (Highly addressed) 25% to 40% Level 2 (Moderately addressed) 5 to 25% Level 1 (Low addressed)
PO2	CO1,CO2,CO3, CO4	30	40	3	
PO3	CO1,CO2, CO3,	19	25.5	2	
PO4	CO1,CO2	2	3	-	
PO5					
PO6					
PO7	CO1,CO2, CO3,	5	6	1	

CO-PO Mapping:

CO No.	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	1	1	-	1	3	3	3
CO2	3	3	3	1	-	-	1	3	3	3
CO3	3	3	3	-	-	-	1	3	3	3
CO4	3	3	3	-	-	-	1	3	3	3
Average	3.0	2.75	2.75	1.0	1	-	1	3	3	3

Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits ..etc.

COURSE CONTENT

1.0 Introduction to R.C.C and Principles of working stress method

Introduction - advantages and disadvantages of R.C.C - Loads to be considered in design - Introduction to I.S Codes - Assumptions in working stress method - Behaviour of concrete and steel under working loads - Modular ratio – critical percentage of steel - Balance, under reinforced, over reinforced sections - Critical and actual depth of neutral axis of a singly reinforced beams – M.R of simply supported singly reinforced beam sections.

2.0 Philosophy of limit state Design

Codes of practice of R.C.C design - Characteristic compressive strength - Modulus of elasticity of concrete - Nominal Mix – Design Mix – differences - Loads to be adopted in R.C.C. design – Dead load, Live load, Wind load (IS 875-1987) - Earth quake load (IS-1893) - Strength and serviceability limit states - Characteristic strength of materials and characteristic loads - Partial safety factors - Design strength of materials and design loads - Assumptions made in the limit state design.

3.0 Analysis and design of Rectangular beams

Stress-strain diagram of singly reinforced R.C.C. beam - Depth of neutral axis, lever arm – M.R of singly reinforced Rectangular section – Balanced, under and over reinforced sections - Critical percentage of steel - Calculation of moment of resistance of the given section - Design of singly reinforced rectangular beam for the given load as per IS 456-2000 - Doubly reinforced sections – Necessity – use (No problems on doubly reinforced beams) - Shear in singly reinforced beams - Nominal shear stress - Permissible shear stress - Methods of providing shear reinforcement in the form of vertical stirrups - combination of vertical stirrups and bent up bars - Code provisions for spacing of stirrups and minimum shear reinforcement (no derivation of equations) - Development of bond stress in reinforcing bars - Design bond stress - Development length – Bond and anchorage concepts and their importance - Curtailment of tension reinforcement - Simple problems on development length - Design of simply supported singly and doubly reinforced rectangular beams for flexure including shear and check for deflection using stiffness criteria - Use of design aids (SP-16).

4.0 Design of slabs

Slabs as structural and functional members - One way and two way slabs - Minimum reinforcement and maximum spacing of reinforcement concrete cover - Stiffness criterion- stiffness ratios for simply supported, cantilever and continuous slabs - One way and two way slabs with various end conditions as per I.S:456 code - Design of one-way slab for flexure and shear for the given grades of concrete, steel, span and loading - Check for deflection using simplified approach of stiffness criteria - Design of two-way slabs with different end conditions, using B.M and S.F coefficients for the unrestrained and restrained conditions as per code - Design of torsion reinforcement for the restrained slabs - Deflection check using

stiffness criteria - Use of design aids (SP-16) - Detailing of reinforcement in stairs spanning longitudinally (No Problems)

5.0 Design of T-beam

Conditions needed for design of a beam as T-Section – Advantages - Code provisions for effective flange width - Three cases of tee beams - Neutral axis, lever arm and moment of resistance for under reinforced, balanced sections using the equations given in the code (no derivations of equations) - Calculation of the moment of resistance of Tee section using the equations given in the code - Use of design aids (SP16).

6.0. Design of columns

Definition of column – Difference between Column and Pedestal - Types of columns (Long and Short) - Effective length for different end conditions - Code provisions for design of columns - Square, rectangular and circular columns with lateral ties - Determination of Load carrying capacity of short column - Square, rectangular, circular, helically reinforced column subjected to axial load only - Design of short square, rectangular and circular columns (with lateral ties only).

7.0 Design of Footings

Footings - Need for footings - Footings under isolated columns - Loads on footings - Code provisions for design of footings - Size of footings for given bearing capacity - Procedure of checking the footing for one-way shear - Two-way shear - Bearing stress - Development length - Design of an isolated square footing of uniform thickness under a column for flexure only.

REFERENCE BOOKS:

1. I.S:456- 2000 Code Book
2. I.S:875 – 1987 Code Book
3. SP-34 - Handbook on concrete reinforcement and detailing (1987).
4. Limit state design of R.C.C structures, Dr. B.C. Punmia, Ashok K.Jain, Laxmi Publication.
5. Design of Reinforced Concrete Structures, S. Ramamrutham, Dhanpatrai publishing company.
6. Design of Reinforced Concrete Structures, V.N. Vazirani and M.M. Ratwani –Khanna publishers.
7. Limit state design of reinforced concrete, P.C. Verghese, PHI Learning
8. Reinforced Concrete Design, N. Krishna Raju & R N Pranesh, New age international publishers.
9. Reinforced Concrete Design, S. Unni Krishna Pillai &Devdas Menon, McGrawHill Education.

Table specifying the scope of syllabus to be covered for Unit Test-I & Unit Test-II

Unit Test	Learning Outcomes to be covered
Unit Test – I	From 1.1 to 4.10
Unit Test – II	From 5.1 to 7.6

CONSTRUCTION PRACTICE

Course Code	Course Title	No. of Periods per Week	Total No. of Periods	Marks for Formative Assessment	Marks for Summative Assessment
C-403	Construction Practice	04	60	20	80

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. of Periods	Weightage of marks	No. of Short Answer Questions	No. of Essay Questions	COs Mapped
1.	Classification, Planning of buildings and foundations	12	26	2	2	CO1
2.	Masonry	10	13	1	1	CO2
3.	Doors, Windows and Lintels, Sunshades	10	13	1	1	CO3
4	Roofs, Floorings and Stair Cases	12	26	2	2	CO4
5	Scaffolding and Form work	06	16	2	1	CO5
6.	Protective, decorative finishes and Termite proofing	10	16	2	1	CO5
	TOTAL	**60**	110	10	8	

COURSE OBJECTIVES:

Upon completion of the Course, the student shall be able to		
Course Objectives	(i)	Gain useful knowledge of concepts, principles and procedures pertaining to building construction system
	(ii)	Understand the skills for the effective execution of building construction work, carry out repairs and maintenance works with safety and quality.

COURSE OUTCOMES:

Course Outcomes	CO1	C-403.1	Design of foundations as per NBC
	CO2	C-403.2	Explain general principles to be followed in construction of masonry work
	CO3	C-403.3	Explain types of doors, windows, ventilators, Lintels and sunshades for effective ventilation.
	CO4	C-403.4	Explain construction methods of roofs, different types of floor finishes and types of Stair cases
	CO5	C-403.5	Justify the arrangement of scaffolding, formwork, Protective and decorative finishes, Termite Proofing for given construction work.

LEARNING OUTCOMES:

Learning outcomes	**1.0 Classification, Planning of buildings and foundations** 1.1 List the components of a building. Explain the functions of the components of a building 1.2 Classify the buildings according to National Building Code with examples. 1.3 Explain the investigations required for foundation as per N.B.C. 1.4 Describe line diagrams of Spread footings, Raft foundation, Pile foundation and Well foundation. 1.5 Explain the terms Bearing capacity, Safe bearing capacity and Ultimate bearing capacity of soil. 1.6 State the loads to be considered in design of foundation. 1.7 List rules for minimum depth, width of foundation and thickness of concrete bed for spread footing foundation. 1.8 Explain the method of constructing spread footing foundation. 1.9 Lists the causes of dampness at basement level. Lists the effects of dampness at basement level. Lists the measures for prevention of dampness at basement level. 1.10 Introduction to Physical factors in designing a building. States various factors to be considered in planning. Inter relationship of different rooms. Aspect, prospect, furniture requirements, roominess, grouping, circulation, privacy, sanitation, elegance and economy. Explain Orientation, Ventilation, stock protection from excessive sun, rain, dust, insects etc., Case study of an existing house over the above

	factors **2.0 Masonry** 2.1 List different types of stone masonry. 2.2 Explain the different types of stone masonry. 2.3 State the general principles to be observed in stone masonry construction 2.4 Explain Bond, Course, Header and Stretcher in brick masonry. 2.5 List general principles of brick masonry. 2.6 Explain with sketches, English bond for alternate layers brick masonry of various wall thicknesses. 2.7 Explain masonry with Pre-cast concrete solid blocks, Hollow blocks, high quality building blocks maintaining bond with sketches. **3.0 Doors, windows, Lintels and sunshades** 3.1 State the principles of locating doors, windows and ventilators in buildings. 3.2 Explain with sketches common and special types of doors, windows and ventilators. 3.3 List the uses of different types of doors, windows and ventilators. 3.4 Explain the fittings and fastenings of doors, windows and ventilators. 3.5 Explain the functions and types of lintels. 3.6 Explain the functions of sunshades, canopy, sun-breakers and porticos. 3.7 Explain about thin lintel developed by CBRI with simple sketches. **4.0 Roofs, Floorings and staircases** 4.1 State the functions and classification of roofs. 4.2 State the classification of trusses based on material and shape. 4.3 Explain with sketches king post truss, queen post truss, fan roof truss, north light roof trusses. 4.4 Explain with sketches A type, B type steel trusses using structural angles and tubular sections as per the provisions of IS code. 4.5 State the common and decorative ceilings used in construction work. Explain the method of fixing Plaster of Paris and fibre glass ceilings. 4.6 State the component parts and functions of flooring. List the requirements of good floor. 4.7 Explain method of construction of C.C flooring, stone slab flooring, tiled flooring, mosaic flooring, Ceramic flooring, and Marble flooring. 4.8 Explain terms: rise, tread, landing, flight, going, hand rail, newal post, baluster and balustrade.

	4.9 Draw the line diagrams of different stairs. **5.0 Scaffolding and Formwork** 5.1 State the purpose of scaffolding. 5.2 Define scaffolding and mention the types. 5.3 List the component parts of tubular scaffolding. 5.4 Sketch and explain about tubular scaffolding. 5.5 State the advantages of tubular scaffolding. 5.6 State the principles of locating stairs. 5.7 State different types of formwork 5.8 Briefly describe the arrangement of formwork for columns, beams, slabs and walls. **6.0 Protective, decorative finishes and Termite Proofing** 6.1 State the objects and methods of plastering. State the steps in providing cement plastering on masonry walls. 6.2 State the use of wall putty as a decorative finish on masonry walls. 6.3 State the objects and types of pointing. 6.4 State the objects of painting. Explain the method of painting new and old walls surfaces. State the paints suitable for painting wood work and steel work. 6.5 Explain briefly the method of white washing, colour washing, distempering the brick masonry wall. 6.6 Define termite proofing. Explain the method of termite proofing.

PO-CO Mapping:

Course Code : C-403	**Course Title: CONSTRUCTION PRACTICE** **No. of COs : 5**				**No. of Periods: 60**
POs	**Mapped with CO No.**	**CO Periods Addressing PO in Col 1**		**Level (1,2,3)**	**Remarks**
		No.	**%**		
PO1	CO1, CO2, CO3, CO4, CO5	22	36.7	2	>40% Level 3 (Highly Addressed) 25% to 40% Level 2 (Moderately Addressed) 5% to 25% Level 1 (Low Addressed) <5% Not Addressed
PO2	CO1, CO4	6	10.0	1	
PO3	CO1	2	3.3		
PO4	CO5	2	3.3		
PO5	CO1, CO2, CO4, CO5	28	46.7	3	
PO6					
PO7					

CO-PO Mapping:

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2	1		2			3	2	2
CO2	3	2			2			3	2	3
CO3	3							3	1	2
CO4	3	2			1			3	1	1
CO5	2	2		1	2			3	2	3
Average	2.6	2.0	1.0	1.0	1.75			3	1.6	2.2

Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz

(vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc

COURSE CONTENT :

1) Classification, Planning of buildings and foundations

Component parts of a building – Their functions - Classification of buildings according to National building code - Site investigation for foundation as per N.B.C, Trial pit, auger boring - Bearing capacity of soils –safe and ultimate bearing capacity - Spread footing foundation for columns and walls - Raft foundation - Pile foundation – RCC Piles – Bearing piles, friction piles and under reamed pile - Well foundation – component parts – sinking of well foundation - Different loads to be considered for the design of foundation as per IS 875 – 1987 - Spread foundation – Depth of foundation by Rankin's formulae– width of foundation – Thickness of concrete bed - Construction of foundation – (spread footing foundation only) - Causes, effects and prevention of dampness at basement level - Principles of planning - Orientation – factors affecting orientation, orientation criteria for Indian conditions – points for obtaining orientation - Ventilation – Stock Protection from excessive sun – sun – rain – dust – insects etc.,

2) Masonry

Classification of stone masonry - Ashlar, Random rubble and Coursed Rubble Masonry - General principles to be observed while constructing stone masonry - Brick Masonry - Bonds in brick masonry (English bond only) for various wall thicknesses - General principles to be observed in construction of brick masonry.

3) Doors, Windows, Lintels and Sunshades

Doors and windows – parts of door window – positioning - Common types of doors- panelled, Glazed and Flush doors - Special types of doors – Flush doors with modern construction materials, revolving doors, collapsible doors, rolling shutters, sliding

doors, referring to A.P.D.S.S for size of doors and windows - Windows – Panelled and Glazed - Ventilators – fixed, swinging type and louvered - Fittings and fastenings for doors and windows - Lintels – Functions – Types of lintels – R.C.C., wood, stone and steel - Sunshade, canopy and sun breakers – lintel cum sunshade.

4) Roofs, Floorings and Stair Cases

Roof – functions of roofs - Classification of roofs – flat roofs – pitched roofs - Different types of trusses – classification based on material and shape king post truss, queen post truss, fan roof truss, north light roof truss, steel trusses of A type and B type using angular and tubular sections as per IS code - Weather proof course on R.C.C. roof - Decorative ceilings for auditoriums – method of fixing Plaster of Paris – Fibre glass - Parts of flooring – Requirements of a good floor - Methods of constructing flooring – cement concrete flooring, stone slab (Kadapa slab, Shahabad stone) floorings, cement plaster flooring, Tiled flooring, mosaic flooring-Terms: rise, tread, landing, flight, going, hand rail, newel post, baluster and balustrade-Line diagrams of different stairs- Location of stairs - Types of different stairs – straight, Quarter turn, half turn, Dog legged, open well, bifurcated, spiral/helical stair case, free standing and slab less stairs/staircase.

5) Scaffolding and Formwork

Scaffolding – Purpose and types – component parts of tubular scaffolding - advantages of tubular scaffolding-different types of formwork- arrangement of formwork for columns, beams, slabs and walls.

6) Protective, decorative finishes and Termite proofing

Plastering – purpose – Types of plastering – procedure for plastering - external finishing - sand faced, pebble dash, acoustic plastering and marble chips – Internal finishing – wall paper and wall putty finishing - Pointing – purpose –Types of pointing - Painting – objects – method of painting new and old wall surfaces, wood surface and metal surfaces – powder coating and spray painting on metal surfaces - White washing – colour washing – Distempering – internal and external walls - Termite proofing – method.

REFERENCE BOOKS:

1. Building Construction by Dr. B.C Punmia, Er. Ashok K.Jain, Dr. Arun K.Jain, Laxmi Publications.
2. Building Construction by Rangwala, Charotar Publications.
3. Building Construction by Sushil Kumar, Standard Publishers Distribution.
4. Building Construction by S.P. Arora & S.P. Bindra, Dhanpat Rai Publications.

Table specifying the scope of syllabus to be covered for Unit Test-I & Unit Test-II

Unit Test	Learning Outcomes to be covered
Unit Test – I	From 1.1 to 3.4
Unit Test – II	From 3.5 to 6.6

TRANSPORTATION ENGINEERING

Course code	Course title	No. of period/week	Total no. of periods	Marks for Formative Assessment	Marks for Summative Assessment
C-404	Transportation Engineering	04	60	20	80

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. of Periods	Weightage of marks	No. of Short Answer Questions	No. of Essay Questions	COs Mapped
1	Introduction to Highways and Geotechnical Engineering.	11	16	2	1	CO1
2	Highway Surveys and Traffic Engineering	11	23	1	2	CO2
3	Highway Constructions and Maintenances	12	26	2	2	CO3
4	Introduction and Permanent way of Railways	11	13	1	1	CO4
5	Station yards and Maintenance of Railways	07	16	2	1	CO4
6	Basics of Bridge Engineering	8	16	2	1	CO5

	Total	**60**	110	10	8	

COURSE OBJECTIVES:

Upon completion of the syllabus, the student shall be able to		
Course Objectives	(i)	Understand the functions of various components of roads and learn the fundamentals of Geotechnical Engineering
	(ii)	Understand the importance of surveys, alignment and geometric features of Highways, bridges and Railways.
	(iii)	Differentiate between types of highway pavements, their construction and maintenance
	(iv)	Understand the concepts of permanent way, points and crossings, station yards in railways, basics terms used in bridge engineering and state different types of bridges.

COURSE OUTCOMES:

Course Outcomes	CO1	C-404.1	Explain the technical terms of Geo-technical Engineering related to highway engineering
	CO2	C-404.2	Describe different surveys to be conducted for fixing the alignment of highway.
	CO3	C-404.3	Discuss the (i) construction of roads (ii) equipment used for high way construction (iii) Maintenance of WBM Road
	CO4	C-404.4	Describe the components of (i) Permanent way (ii) Station Yards (iii) Maintenance measures of a railway track
	CO5	C-404.5	Explain the basics of bridge engineering.

LEARNING OUTCOMES:

Learning Outcomes	**1.0 Introduction to Highways and Geotechnical Engineering** 1.1. State the importance of transportation engineering. 1.2. State the importance of I.R.C & List the functions of I.R.C 1.3. Classify roads as per I.R.C 1.4. Define the terms: 1. Width of pavement, 2. Shoulder,3. Formation width, 4. Right of way, 5. Camber, 6. Gradient, 7. Super elevation, 8. Sight distance. 1.5. Explain the components of a road with a sketch. 1.6. State the three types of gradients 1. Ruling gradient, 2. Limiting gradient and 3. Exceptional gradients and their recommended values. 1.7. State recommended values of gradients by I.R.C 1.8. State the need for providing super elevation and write the

	formula for super elevation 1.9 State the need for curves in highways and state the different types of horizontal curves adopted in road. State the different types of vertical curves adopted in road 1.10. List physical properties of soils & define the following properties of soils: 1. Plasticity, 2. Cohesion, 3. Consolidation, 4. Compaction, 5. Permeability, 6. Compressibility 1.11. State the different systems of classification of soils &Explain the textural classification of soils and I S Classification of soils. 1.12. Define the following terms: 1. Ultimate bearing capacity of soil, 2. Safe bearing capacity, and 3. Net safe bearing capacity. **2. Highway Survey and Traffic Engineering** 2.1. Define alignment of road. 2.2. State the factors influencing selection of alignment for a road in plain and hilly areas. 2.3. List the surveys required for fixing alignment. 2.4. State the different data required for the preparation of highway project. 2.5. Explain various engineering surveys conducted to fix the alignment of a road. 2.6. State the importance of traffic census/traffic surveys. 2.7. List various traffic surveys conducted. 2.8. Explain the following with sketches: 1. Traffic islands 2. Interchanges. 2.9. State types of pavement markings with sketches and state its functions 2.10. State the purpose of traffic signs. State the functions of traffic signs with sketches. **3. Highway construction and Maintenance** 3.1. State the need for road drainage. 3.2. Explain the methods of providing surface and sub-surface drainage. 3.3. State the materials used in construction of different types of roads 3.4. List the tests on Bitumen. 3.5. State the equipment/machinery used in construction of different roads. 3.6. Explain the methods of construction of different types of roads. 3.7. Explain the maintenance of WBM of roads. 3.8. Explain the different types of joints used in C.C roads with sketches.

	3.9. State the need for joints in C.C roads. **4. Introduction to Permanent way of Railways** 4.1. State the advantages of Railways. 4.2. Define gauge and 4.3. Classify gauges. 4.4. State the component parts of a permanent way 4.5. List the functions of each component parts of a permanent way 4.6. State the requirements/characteristics of 1. Good rail, 2. Rail joint, 3. Sleeper and 4. Ballast. 4.7. State the different types of 1. Rails, 2. Joints, 3. Rail fittings, 4. Sleepers, 5. Ballast used in Indian Railways with sketches (where ever required). **5. Station yard and Maintenance of Railways** 5.1 Describe different types of turnouts with sketches. 5.2 Describe different types of crossings with sketches 5.3 Classify stations. 5.4 State different maintenance measures of a railway track. 5.5 State the duties of a permanent way inspector. **6. Basics of Bridge Engineering** 6.1. Classify the bridges based on materials, position of bridge floor and form/type of super structure. 6.2. Define the terms: 1. Waterway, 2. Linear waterway, 3. Afflux, 4. Vertical clearance, 5. Scour depth, and 6. Free board. 6.3. State the factors influencing selection of site for a bridge. 6.4. State component parts of a bridge sub-structure with sketches 6.5. List the functions of a bridge sub-structure 6.6. Distinguish between deck and through bridge. 6.7. Draw different types of bridge super structures. 6.8. List different types of 1. Causeways and 2. Culverts. 6.9. State suitability of different types of culverts and causeways. 6.10. Sketch different types of causeways and culverts

PO-CO Mapping:

Course Code: C-404	Course Title: TRANSPORTATION ENGINEERING No of COs : 5				No. Of periods :60
POs	**Mapped with CO No**	**CO Periods Addressing PO in Col 1**		**Level (1,2,3)**	**Remarks**
		No	**%**		
PO1	CO1,CO2,CO3,CO4,CO5	16	27	2	>40% Level 3 (Highly Addressed)
PO2	CO1,CO2,CO3,CO4,CO5	28	47	3	
PO3					25% to 40% Level 2 (Moderately Addressed)
PO4	CO3,CO4	8	13	1	
PO5	CO3,CO4	8	13	1	5% to 25% Level 1 (Low Addressed)
PO6					
PO7					<5% Not Addressed

CO-PO Mapping:

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2						2	3	3
CO2	2	3						2	3	3
CO3	3	2		2	2			2	3	3
CO4	3	3		2	2			2	2	3
CO5	3	3						2	3	3
Average	2.6	2.6		2	2			2	3	3

Note: The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits ..etc.

COURSE CONTENT

1. **Introduction to Highways and Geotechnical Engineering**

Importance of transportation engineering- Importance of I.R.C - List the functions of I.R.C – Classification of roads as per I.R.C – Define (i) Width of pavement (ii) Shoulder (iii) Formation width (iv) Right of way (v) Camber (vi) Gradient (vii) Super elevation and (viii) Sight distance

components of a road - types of gradients and their recommended values by I.R.C - need for providing super elevation and its formula – Necessity of curves in highways - types of horizontal curves and vertical curves adopted in roads – Physical properties of soil like plasticity, cohesion, consolidation, compaction, Permeability and compressibility - Soil moisture content – Specific gravity and density - Types of soils – Residual soil – Transported soil – sand – silt – clay – peat –

Till – Tull – loess – Bentonite – Soils in India - Different systems of classification of soils – Textural classification – I S classification of soils - Bearing Capacity – Definition – Importance in foundation design.

2. **Highway Survey and Traffic Engineering**

   Alignment of Road - Definition - factors influencing selection of alignment for a road in plain and hilly areas - List the surveys required for fixing alignment - Different data required for the preparation of highway project - Various engineering surveys conducted to fix the alignment of a road - Traffic census/traffic surveys - Importance – Types – Traffic islands and Interchanges - types of pavement markings and its functions - purpose of traffic signs and its functions

3. **Highway construction and Maintenance**

   Necessity of road drainage - Methods of providing surface and sub-surface drainage - materials used in construction of different types of roads - Tests on Bitumen - equipment/machinery used in construction of different roads - Methods of construction of different types of roads - maintenance of WBM of roads - Different types of joints used in C.C roads - necessity for joints in C.C roads

4. **Introduction and Permanent way of Railways**

   Railways - advantages – Definition and classification of gauges – Functions of each component part of a permanent way and its requirements/characteristics - Different types of 1. Rails, 2. Joints, 3. Rail fittings, 4. Sleepers, 5. Ballast used in Indian Railways with sketches (wherever required).

5. **Station yard and Maintenance of Railways**

   Classification of stations - Types of turnouts and crossings with sketches maintenance measures of a railway track - Duties of a permanent way inspector.

6. **Basics of Bridge Engineering**

   Classification of bridges based on materials, position of bridge floor and form/type of super structure - Factors influencing selection of site for a bridge - Data required for preparation of bridge project. Definitions - 1. Waterway 2. Linear waterway 3. Afflux 4. Vertical clearance 5. Scour depth, and 6. Free board - Formulae for economical span and afflux - component parts of a bridge sub-structure with sketches - Functions of a bridge sub-structure - Distinguish between deck and through bridge – sketches of different types of bridge super structures - List different types of 1. Causeways and 2. Culverts - suitability of different types of culverts - suitability of different types of causeways – Sketches of different types of causeways – Sketches of different types of culverts

REFERENCE BOOKS:

1. Highway Engineering by S. C. Rangwala,Charotar Books Distributors
2. Railway Engineering by S. C. Rangwala,Charotar Publishing House Pvt. Ltd.
3. Bridge Engineering by S. C. Rangwala,Charotar Publishing House Pvt. Ltd.
4. Highway Engineering by Khanna and Justo-Nem Chand & Sons
5. Transportation Engineering by L.R.Kadiyali,Khanna Publishing House

Table specifying the scope of syllabus to be covered for Unit Test-I & Unit Test-II

Unit Test	Learning Outcomes to be covered
Unit Test – I	From 1.1 to 3.5
Unit Test – II	From 3.6 to 6.10

IRRIGATION ENGINEERING

Course code	Course title	No. of period/week	Total no. of periods	Marks for Formative Assessment	Marks for Summative Assessment
C-405	Irrigation Engineering	04	60	20	80

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. of Periods	Weightage of marks	No. of Short Answer Questions	No. of Essay Questions	COs Mapped
1.	Nature and scope of Irrigation Engineering	6				CO1
2.	Elements of Hydrology	8				CO2
3.	Head works	8				CO2
4.	Gravity dams and Earth dams	12				CO3
5.	Distribution works	10				CO4
6.	Soil Erosion, Water logging, River Training works and Water management	10				CO5
7.	Water and Watershed Management	6				CO5
	Total	60				

COURSE OBJECTIVES:

Upon completion of the course the student shall be able to		
Course Objectives	(i)	Aware of necessity and scope of Irrigation Engineering, Hydrology, calculation of average annual rainfall of an area and maximum flood discharge
	(ii)	Enable to gain knowledge about Storage and diversion Head Works, component parts, effect of percolation, Gravity dams and Earthen dams –failures of these dams and remedial measures.
	(iii)	Know about the Distribution works, maintenance of canals, uses of Cross drainage works, causes, effects and prevention of Soil erosion, Water logging, types and uses of river training works, Systems of Water management and Watershed Management.

COURSE OUTCOMES:

Course Outcomes	CO1	C-405.1	Explain various methods of irrigation.
	CO2	C-405.2	Describe the (i) Elements of Hydrology (ii)Diversion and storage head works.
	CO3	C-405.3	Analyse different types of failures of dams in construction
	CO4	C-405.4	Discuss the alignment of canals, cross drainage works and their maintenance
	CO5	C-405.5	Describe 1. Soil erosion 2. Water logging 3.Systems of Water management and Watershed Management

LEARNING OUTCOMES:

Learning Outcomes	**1.0 Nature and scope of Irrigation** 1.1 Define Irrigation 1.2 State the necessity of irrigation. 1.3 List advantages and disadvantages of irrigation. 1.4 State different types of irrigation 1.5 Distinguish between 1. Perennial and inundation irrigation, 2. Flow and Lift irrigation, and 3. Storage and Direct irrigation. 1.6 State Principal crops in India and their seasons and explain

	Kharif crops and Rabi Crops 1.7 Define the following terms: 1. Duty, 2. Delta, 3. Base period and 4. Crop period 1.8 Explain different methods of expressing duty 1.9 State the relationship between duty and delta. 1.10 Explain the factors affecting duty 1.11 State the duty figures for principal crops and Solve simple problems on duty **2.0 Elements of Hydrology** 2.1 Describe Hydrological cycle 2.2 Explain the term Precipitation 2.3 State different types of rain gauges and explain the method of measurement of rainfall using Simon's Rain gauge and Float type automatic recording rain gauge 2.4 Explain precautions in setting and maintenance of rain gauges. State uses of rain fall records 2.5 Explain method of calculation of average annual rainfall of an area by Theisen's Polygon method and solve the problem on calculation of average annual rainfall by Theisen's Polygon method 2.6 Define the following: 1. Catchment, 2. Intercepted catchment, 3. Free catchment and 3. Combined catchment area 2.7 State the characteristics of 1. Good catchment, 2. Average catchment and 3. Bad catchment 2.8 Explain the term Run-off and factors affecting runoff 2.9 Explain methods of estimating runoff and solve the problems on estimating run-off 2.10 Understand the term maximum flood discharge and explain various methods of determining maximum flood discharge from rain fall records. 2.11 State Ryve's and Dicken's Formulae and solve simple problems on estimating maximum flood discharge 2.12 Explain the importance of river gauging and Lists the factors for selecting suitable site for a gauging station 3.0 **Head works** 3.1 Classify the head works and State the suitability of different types of head works under different conditions 3.2 State the factors for selecting suitable site for diversion head

	works 3.3 Describe the component parts of Diversion works with sketch 3.4 Distinguish between barrages and Weirs 3.5 Describe head regulator and scouring sluice with sketch 3.6 Describe flood banks and other protective works 3.7 Define the terms: Percolation, Percolation gradient, Uplift, scour and uplift pressure 3.8 Explain the effects of percolation on irrigation works **4.0 Gravity dams and Earth dams** 4.1 Distinguish between Rigid dams and Non-rigid dams 4.2 State factors influencing selection of site for reservoirs and dams. 4.3 Define the terms: Full reservoir level, Maximum water level, Top bund level, Dead storage, Live storage, Free board, Gravity dam and Spillway. 4.4 Explain the causes of failure of gravity dams and their remedies. 4.5 Draw the elementary profile of a gravity dam for a given height and draw the practical profile of a low dam. 4.6 Explain uplift pressure and explain need for drainage galleries with sketches 4.7 Explain construction and contraction joints with sketches 4.8 State need and types of grouting of foundations and explain the method of grouting of foundations in gravity dams 4.9 State different types of spillways and their suitability and draw sketches 4.10 State the situations in which earth dams are suitable 4.11 State the three types of earth dams with sketches of typical cross sections 4.12 Explain causes of failure of earthen dams and their precautions 4.13 Explain the terms with sketches Saturation gradient and Phreatic line 4.14 Explain drainage arrangements in earth dams with a neat sketch 4.15 Explain the maintenance of earth dams **5.0 Distribution works** 5.1 Classify canals. **5.2** State the different methods of canal alignment and the situations in which each is suitable. 5.4 Sketch typical cross sections of canals in cutting, embankment and Partial cutting. Explain balanced depth of cutting and its necessity 5.5 State the need for canal lining and State advantages and disadvantages of canal linings. Explain different types of canal linings 5.6 Explain the maintenance required for canals and their

	regulation 5.7 Explain Lacey's regime theory and Kennedy's silt theory (only explanation of formulae) (No problems) 5.8 State need for cross drainage works and State different types of cross masonry works (cross regulator, drainage & communication) and their objectives. 5.9 Describe the following with sketches 1. Aqueduct, 2. Super passage, 3. Under tunnel, siphon, 4. Level crossing and 5. Inlet and outlet 6.0 **Soil erosion, water logging, River training works** 6.1 Explain terms: Soil erosion, Reclamation and Water logging. 6.2 State causes of soil erosion and ill effects of soil erosion 6.3 Explain various methods of prevention of soil erosion. 6.4 State causes of water logging and ill effects of water logging 6.5 Explain various methods of prevention of water logging 6.6 State methods of land reclamation. 6.7 State different stages of flow of rivers 6.8 Explain characteristics of Delta Rivers 6.9 Explain term meandering of river 6.10 State objectives of river training works and Explain various types of groynes and bell's bunds with sketches **7.0 Water and watershed management** 7.1 State soil-water plant relationship. 7.2 Describe the following irrigation methods: Broader irrigation, Check basin irrigation, Furrow irrigation, Sprinkler irrigation and Drip irrigation 7.3 Explain on farm development and Describe 1. Warabandi system and 2. Water user associations 7.4 State the duties of water user associations 7.5 Explain the concept of Water shed and Water shed management 7.6 State need for watershed development in India and Describe different approaches to water shed management 7.7 Explain water harvesting and explain methods of 1. Rain water harvesting and 2. Catchment harvesting 7.8 Explain soil moisture conservation methods 7.9 Explain method of water harvesting through check dams 7.10 Explain different methods of artificial recharge of ground water 7.11 Explain artificial recharges of ground water using percolation tanks

PO-CO Mapping:

Course Code: C-405	Course Title: Irrigation Engineering No of COs : 5				No. of periods: 60
POs	**Mapped with CO No**	**CO Periods Addressing PO in Col 1**		**Level (1,2,3)**	**Remarks**
		Nos.	**%**		
PO1	CO1,CO2,CO3,CO4,CO5	24	40	3	>40% Level 3 (Highly Addressed)
PO2	CO2,CO3,CO4,CO5	24	40	3	
PO3					25% to 40% Level 2 (Moderately Addressed)
PO4	CO2,CO3,CO4,CO5	5	8	1	
PO5	CO2,CO3,CO4,CO5	4	7	1	5% to 25% Level 1 (Low Addressed)
PO6					
PO7	CO5	3	5	1	<5% Not Addressed

CO-PO Mapping:

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	-						2	3	2
CO2	2	3		2	3			2	3	2
CO3	2	3		3	2			2	3	2
CO4	2	3		3	3			2	3	2
CO5	3	2		2	2		3	2	3	2
Average	2.25	2.75		2.5	2.5		3	2	3	2

Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits ..etc.

COURSE CONTENT

1. Nature and scope of Irrigation Engineering

Definitions- Necessity of irrigation - Advantages and disadvantages - Perennial and Inundation irrigation - Flow and Lift irrigation-Direct and Storage irrigation.

Principal crops - Kharif and Rabi crops -Dry and wet crops - Definition of duty, delta, base period, and crop period, Duty-different methods of expressing duty-base period-relationship between duty and delta- factors affecting duty – Requirements for precise statement of duty - Duty figures for principal crops-simple problems on duty.

2. Elements of Hydrology

Precipitation – Types of rain gauges – Simon's rain gauge - Float type automatic - recording gauge – precautions in setting and maintenance – rain fall records – Hydrological cycle-average annual rainfall of an area -Theissen's polygon method.

Catchment basin in catchment area - Free catchment - combined catchment - Intercepted catchment – Run- off - Factors affecting run-off - Nature of catchment, run off coefficient - Methods of estimating run off - Empirical formulae

Maximum flood discharge - Methods of determining maximum flood discharge from rainfall records, Ryve's and Dicken's formulae, H.F.L Marks, Gauge reading – Simple problems on M.F.D. - River gauging – Importance – Site selection for river gauging

3. Head Works

Classification of head works - Storage and diversion, head works - their suitability under different conditions - Suitable site for diversion works - General layout of diversion works-brief description of component parts of diversion works, brief description of component parts of a weir - Barrages and Weirs.

Head Regulator-scouring sluice-flood banks and other protective works. Percolation -Percolation gradient-uplift pressures - Effect of percolation on irrigation works.

4. Gravity dams and Earth dams

Dams - Rigid and non-rigid dams - main gravity dams-failures of gravity dams and remedial measures - elementary profile – limiting height of dam - low dam and high dam - free board and top width – Practical profiles of low dam - uplift pressure - drainage gallery - Contraction joints - Grouting of foundations - spillways

Earth dams – situations suitable for Earth Dams - Types of earth dams - Causes of failure of earth dams and precautions – Saturation gradient and phreatic line-drainage arrangements - Construction details of earth dams - breaching sections - breach filling - Maintenance of earth dams.

5. Distribution works

Canals-classification-different methods of canal alignment-typical cross section of canal in cutting, embankment, partial cutting and embankment – Berms - standard dimensions - balancing depth of cutting - canal lining - Necessity - types – Maintenance of canals.

Lacey's regime Silt Theory and Kennedy's Silt Theory (only explanation of formulae)- Comparison of two theories (No problems)

Cross drainage works - Necessity – General description of aqueducts – Super passage – Under tunnel - siphon level crossing- Inlet and outlet.

6. Soil erosion, Water logging and River Training works

Soil erosion-methods of prevention of soil erosion-causes and effects- of water logging-preventing water logging methods-land reclamation - Different stages of flow of rivers-characteristics of Delta Rivers - Meandering - Object of river training - River training works- List out the various types of groynes and Bell's bunds.

7. Water and Watershed management

Soil - water plant relationship -Irrigation methods-Broader Irrigation, check basin irrigation-Furrow Irrigation-Sprinkler irrigation-Drip irrigation – farm development, water user associations &Warabandi system, Concept of Watershed Management – Objectives of watershed Management – Need for watershed development in India – Integrated and multidisciplinary approach for water shed management, Water Harvesting: Rainwater harvesting, Catchment harvesting – Soil moisture conservation – Check dams – Artificial recharges and percolation tanks.

REFERENCE BOOKS:

1. Irrigation and Water Power Engineering, B.C. Punmia,Dr. Pande B.B. Lal, Ashok Kumar Jain,Arun Kumar Jain – Laxmi Publication.
2. Irrigation and Water Power Engineering Das and Madan Mohan Das & Mimi Das Saikia , PHI Publication
3. Irrigation Engineering and Hydraulic structures, Santhosh Kumar Garg , KHANNA PUBLISHERS
4. Irrigation Engineering, N NBasak , McGrawHill Publications

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TEST-I & II

Unit Test	Learning outcomes to be covered
Unit Test-I	From 1.1 to 4.9
Unit Test-II	From 4.10 to 7.11

CIVIL ENGINEERING DRAWING – II					
Course code	**Course Title**	**No. of periods/week**	**Total No. of periods**	**Marks for Formative Assessment**	**Marks for Summative Assessment**
C-406	Civil Engineering Drawing – II	06	90	40	60

TIME SCHEDULE

S.No.	**Chapter/Unit Title**	**No. of Periods**	**Weightage of marks**	**No. of Short Answer Questions**	**No. of Essay Questions**	**COs Mapped**
1.	Culverts & Bridges	30	25 + 12 = 37	2	1	CO1
2.	Public health engineering drawings	15		1		CO2
3.	Irrigation drawings	45	15 + 8 = 23	2	1	CO3
	Total Periods	90	60	5	2	

Note: In question paper, Part –A consists of FIVE questions of 4 marks each and Part –B consists of two questions of 25 & 15marks. 25 Marks question is from Chapter-1 or 2 and15 Marks question from Chapter-3.

COURSE OBJECTIVES:

Upon completion of the Course, the student shall be able to		
Course Objectives	1	Prepare to scale the different views of culverts, T-beam bridge, public health buildings and basic irrigation engineering drawings.
	2	Impart skills to student to prepare different views of Irrigation Engineering & Public Health Engineering works using CAD.

COURSE OUTCOMES:

Course Outcomes	CO1	C-406.1	Draw plan, cross section and longitudinal section of Culverts and Bridges from given data
	CO2	C-406.2	Draw plan, cross section and longitudinal section of Public health engineering works viz., Septic tank, Sanitary block, Overhead tank for a given set of specifications
	CO3	C-406.3	Draw Plan, cross section and Longitudinal section of Earthen bund, Tank surplus weir, Canal drop, Tank sluice with tower head and canal regulator for a given set of specifications

LEARNING OUTCOMES:

Learning Outcomes	1.0 **Culverts & T-Beam bridges** 1.1 Draw the plan, cross sectional elevation and longitudinal sectional elevation of 1.Pipe culvert, 2. R.C.C slab culvert 1.2 Identify the component parts of the pipe culvert and R.C.C. slab culvert from the given set of specifications. 1.3 Label the component parts of a given R.C.C.T-beam bridge 1.4 Draw the sectional elevation, plan and cross section of Two span R.C.C. T-beam bridge with square wing walls. **2.0 Public health Engineering works** 2.1 Label the component parts of given Public health engineering structures 2.2 Draw the sectional elevation, plan and cross section of Public health Engineering works viz., septic tank, sanitary block, overhead tank, from the set of given specifications **3.0 Irrigation Engineering structures** 3.1 Label the component parts of given Irrigation Engineering 3.2 Draw the sectional elevation, plan and cross section of different Irrigation engineering structures bridge from the set of given specifications

PO-CO Mapping:

Course Code: C-406	Course Title:Civil Engineering Drawing – II No of COs: 3				No. of Periods: 90
POs	Mapped with CO	CO Periods Addressing PO in Col 1		Level (1,2,3)	Remarks
		No	%		
PO1	CO1, CO2, CO3	18	20	1	>40% Level 3 (Highly Addressed)
PO2	CO1, CO2, CO3	36	40	3	
PO3	CO1, CO2, CO3	36	40	3	25% to 40% Level 2 (Moderately Addressed)
PO4					
PO5					5% to 25% Level 1 (Low Addressed)
PO6					
PO7					<5% Not Addressed

CO-PO Mapping:

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2					2	3	2
CO2	3	3	2					2	3	2
CO3	3	3	2					2	3	2
Average	3	3	2					2	3	2

Note: The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits ..etc.

COURSE CONTENT

1. Simple Culverts & Bridges

Draw the plan, cross-sectional elevation and longitudinal sectional elevation of

1. Pipe culvert (Single Pipe)
2. R.C.C slab culvert with square returns.
3. R.C.C slab culvert with splayed wings
4. Two-Span R.C.C T-beam bridge with square return walls

2. **Public health engineering drawings**

1. Septic tank with details of connections to a dispersion trench/soak pit
2. Sanitary block for a public building
3. R.C.C. rectangular/square overhead tanks

3. Irrigation engineering drawings

1. Earthen bunds – Three types.
   a) Homogeneous type b) Zoned embankment type c) Diaphragm type
2. Tank surplus weir with splayed wing walls.
3. Canal drop (Notch type)
4. Tank sluice with tower head.
5. Canal regulator

REFERENCE BOOKS:

1. Civil Engineering Drawing-II by N.Srinivasulu -Radiant Publishing House
2. Civil Engineering Drawing-II by M.Chakraborthy -UBS Publications
3.Civil Engineering Drawing-II by Bajaj,Kataria& Raheja -North publication

CONCRETE & SOIL TESTING PRACTICE

Course code	Course title	No. of period/week	Total no. of periods	Marks for Formative Assessment	Marks for Summative Assessment
C-407	Concrete & Soil Testing Practice	03	45	40	60

S. No.	Major Topics	No. of Periods	COs Mapped
1.	Tests on Aggregates	12	CO1
2.	Tests on Concrete	15	CO2
3.	Non-Destructive Tests	6	CO3
4.	Tests on Soils	12	CO4
	Total	45	

COURSE OBJECTIVES:

Upon completion of the Course, the student shall be able to		
Course Objectives	(i)	Familiarize with the knowledge of different materials and tools used in Concrete and Soil Testing.
	(ii)	Use various basic implements used in testing of various Civil Engineering construction materials.
	(iii)	Know the etiquette of working with the fellow work force
	(iv)	Reinforce theoretical concepts by conducting relevant experiments/exercises.

COURSE OUTCOMES

Course Outcomes	CO 1	C-407.1	Determine the Specific Gravity of fine and coarse aggregate, Impact value, Crushing value, Abrasion value, Flakiness index and Elongation index of coarse aggregate
	CO 2	C-407.2	Perform the Workability test of concrete by Slump Cone Test, Compaction factor test and determines the compressive strength and the split tensile strength of concrete and learns to Design a concrete mix
	CO 3	C-407.3	Perform the Rebound hammer test and Ultrasonic Tests on concrete to know the strength and durability of concrete structures
	CO 4	C-407.4	Perform various tests on soil to know its properties

LEARNING OUTCOMES:

Learning Outcomes	**1.0 Tests on Aggregate** **1.1 Specific Gravity of fine and coarse aggregate** • Study the importance of specific gravity of fine and coarse aggregate • State the range of specific gravity values for various naturally available fine and coarse aggregate • Use the apparatus required for conducting specific gravity test on both fine and coarse aggregate • Perform the specific gravity tests for both fine and coarse aggregate **1.2 Impact value of coarse aggregate** • Study the significance of impact value of aggregate used for road construction • State the standards on impact value of aggregate used for various civil engineering works as per IS-383 • Use the apparatus required for conducting impact test on aggregate • State the procedure for preparing the sample and no. of samples required for the given work • Explain the procedure for conducting impact test on aggregate • Perform impact test on given sample of coarse aggregate • Draw inferences by conducting impact test on different types of natural aggregate **1.3 Crushing value of coarse aggregate** • Study the significance of crushing value of aggregate used for various civil engineering works • State the standards on crushing value of aggregate used for various civil engineering works as per IS-383 • Use the apparatus required for conducting crushing test on aggregate • State the procedure for preparing the sample and no. of samples required for the given work • Explain the procedure for conducting crushing test on aggregate • Perform crushing test on a given sample of coarse aggregate • Draw inferences by conducting crushing test on different types of natural aggregate **1.4 Abrasion value of coarse aggregate**

	• Study the significance of abrasion value of aggregate used for various civil engineering works • State the standards on abrasion value of aggregate used for various civil engineering works as per IS-383 • Use the apparatus required for conducting abrasion test on aggregate • State the procedure for preparing the sample and no. of samples required for the given work • Explain the procedure for conducting abrasion test on aggregate • Perform abrasion test on given sample of coarse aggregate • Draw inferences by conducting abrasion test on different types of natural aggregate **1.5 Flakiness Index of coarse aggregate** • Study the significance of flakiness index of aggregate on strength and workability properties of concrete • State the standards on flakiness index of aggregate • Use the apparatus required for conducting flakiness index of coarse aggregate • Explain the procedure for conducting the flakiness index test on coarse aggregate • Determine the flakiness index of a given sample of coarse aggregate **1.6 Elongation Index of coarse aggregate** • Study the significance of elongation Index of aggregate on strength and workability properties of concrete • State the standards on elongation Index of aggregate • Use the apparatus required for conducting elongation Index of coarse aggregate • Explain the procedure for conducting the elongation Index test on coarse aggregate • Determine the flakiness index of a given sample of coarse aggregate **2.0 Tests on concrete** • Determine suitability of fresh and hardened concrete for the given conditions of workability and strength • Study the importance of workability on strength properties of concrete • State various types of tests used for measuring the workability of fresh concrete • State standards on workability of concrete used for different places of construction work **2.1 Slump cone test**

	• Use apparatus required for conducting slump test • Explain the procedure for conducting slump test of workability • Perform slump test on the concrete made of given sample of ingredients • Draw inference from test results on slump test of workability of concrete made with coarse aggregate having different elongation index • Draw inference from test results on slump test of workability of concrete made with coarse aggregate having different flakiness index • Compare the slumps of concrete made with gap graded coarse aggregate and well graded coarse aggregate • Study the changes in workability with different water-cement ratios • Study the changes in workability by adding dry cement to poorly workable concrete **2.2 Compaction factor test** • State the purpose of compaction of concrete • Use apparatus required for conducting compaction factor test • Explain the procedure for conducting compaction factor test of workability • Perform compaction factor test on the concrete made of given sample of ingredients • Draw inference from test results on compaction factor test of workability of concrete made with coarse aggregate having different elongation index values • Draw inference from test results on compaction factor test of workability of concrete made with coarse aggregate having different flakiness index values • Compare the compaction factors of concrete made with gap graded coarse aggregate and that made with well graded coarse aggregate • Study the changes in compaction factor of a poorly workable concrete by admixtures • Study the methods of enhancing workability of concrete without using any admixtures **2.3 Casting of Cement concrete cubes** • Study the purpose of casting of concrete cubes • Use equipment required for casting of cement concrete cubes • Explain the procedure for casting concrete cubes • Cast the concrete cubes with given ingredients **2.4 Testing of cement concrete cubes for compression** • Study the importance of testing concrete cubes • Use equipment required for conducting compression test concrete cubes • State the precautions to be taken for testing of concrete cubes

	• Explain the procedure for conducting compression test on concrete cubes • Draw inference from test results on compressive strength of concrete cubes made with coarse aggregate having different elongation index values • Draw inference from test results on compressive strength of concrete cubes made with coarse aggregate having different flakiness index values • Compare the compressive strengths of concrete cubes of concrete made with gap graded coarse aggregate and that made with well graded coarse aggregate • Compare the compressive strengths of concrete cubes made and cured with potable water and concrete cubes made and cured with non-potable water **2.5 Split Tensile Strength of concrete** • Study the importance of split tensile strength of concrete • Cast the concrete cylinders with given ingredients • Explain the procedure for conducting split tensile strength test on concrete cylinders • Perform split tensile strength test on concrete cylinder **2.6 Design mix of concrete proportion as per IS: 10262 – 2009** • Study the various elements of design mix of concrete as per IS:10262-2009 • Conduct tests to find specific gravity, bulk density and sieve analysis of aggregate for the preparation of design mix of concrete • Write the procedure for design mixing of concrete • Calculate the proportions of ingredients of concrete as per IS:10262-2009 • Cast cubes of trail mixes to decide the proportion of concrete • Perform the compression tests on concrete cubes casted as per design mix **3.0 Non-Destructive Tests on concrete** • State the importance of non-destructive tests • State the apparatus/equipment required for the non-destructive tests • Explain the procedure for conducting non-destructive tests • Perform the non-destructive tests like Rebound hammer tests, ultrasonic tests on the given hardened concrete • Record the observations of tests • Draw the inferences from the test results **4.0 Tests on Soils** **4.1 Sieve Analysis – Classification of soil** • Study the classification of various types of soils • Use apparatus required for conducting sieve analysis of soils • Explain the procedure for conducting sieve analysis of soils • Perform sieve analysis over a given soil sample

	4.2 Atterberg Limits of Soil • Study the significance of Atterberg limits of soil in civil engineering activities • Study Atterberg limits of soils • Use apparatus required for conducting tests to determine Atterberg limits of soil • Explain the procedure for conducting (a) Liquid Limit (b) Plastic Limit (c) Shrinkage Limit tests • Perform Limit Test, Plastic Limit Test & Shrinkage Limit Test over given sample of soil • Compare the observations of tests conducted on different types of soils • Calculate the Plasticity Index value of a given soil sample from the observations of test • Classify given soil sample based on sieve analysis and Atterberg limits **4.3 Field Density of soil (Sand Replacement Method)** • Study the significance of field density of soil • Use the apparatus required for conducting field density of soil • Explain the procedure for conducting field density test on soil by sand replacement method • Perform field density test of soil by sand replacement method **4.4 Proctor Compaction Test** • Study the significance of proctor compaction test • Use the apparatus required for conducting Proctor's compaction test • Explain the procedure for conducting Proctor compaction test • Perform Proctor compaction test over given sample of soil • Compare the observations of tests conducted on different types of soils • Draw the graph for Proctor's compaction test • Calculate the values OMC and MDD of given soil sample from the observations of test

PO-CO MAPPING:

Course Code : C-407	**Course Title: Concrete & Soil Testing Practice** **Number of COs: 04**				**No. of Periods: 45**
POs	**Mapped with CO No.**	**CO Periods addressing PO in Column 1**		**Level (1,2,3)**	**Remarks**
		No	%		
PO1	CO1, CO2, CO3, CO4	6	13	1	> 40% Level 3 Highly addressed

PO2	CO1, CO2, CO3, CO4	18	40	3	
PO3					
PO4	CO1, CO2, CO3, CO4	6	13	1	25% to 40% Level 2 Moderately addressed
PO5	CO1, CO2, CO3, CO4	7	17	1	
PO6	CO1, CO2, CO3, CO4	8	17	1	5 to 25% Level 1 Low addressed
PO7					<5% Not addressed

CO-PO MAPPING:

CO No.	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO 3**
CO1	2	3		2	3	2		2	2	3
CO2	2	3		3	3	2		2	2	3
CO3	3	2		3	2	2		2	2	3
CO4	2	2		2	2	2		2	2	3
Average	2.25	2.5		2.5	2.5	2		2	2	3

Note: The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits ..etc.

KEY Competencies to be achieved by the student

S. No	**Experiment Title**	**Competencies**	**Key Competency**
1	Specific Gravity of fine and coarse aggregate	• Take weights of empty pycnometer, pycnometer with water and pycnometer with aggregate accurately	• Take weights of empty pycnometer, pycnometer with water and pycnometer

		• Record the observations accurately • Calculate the values correctly	with aggregate accurately
2	Impact value of coarse aggregate	• Prepare of sample correctly • Weigh the cup and aggregate accurately • Count number of strokes accurately • Weigh residue retained on 2.36 mm sieve correctly	
3	Crushing value of coarse aggregate	• Prepare of sample correctly • Weigh the mould and aggregate accurately • Apply the load at required rate and to the required period accurately • Weigh residue retained on 2.36 mm sieve correctly	• Apply the load at required rate and to the required period accurately
4	Abrasion value of coarse aggregate	• Weigh the aggregate accurately • Count the required number of rotations correctly • Weigh residue retained on 1.70 mm sieve accurately	
5	Flakiness Index of coarse aggregate	• Arrangement of sieves in correct order • Weighing the aggregate passing through thickness gauge correctly	
6	Elongation Index of coarse aggregate	• Arrange the sieves in correct order • Weigh the aggregate retaining over length gauge correctly	
7	Slump cone test on concrete	• Weigh the material accurately • Apply required no. of tampings for each layer of concrete • Measure the subsidence accurately	• Measure the subsidence accurately

8	Compaction factor test on concrete	• Weigh the material accurately • Weigh the mould and concrete accurately • Calculate the compactor factor correctly	
9	Casting of Cement concrete cubes	• Weigh the material accurately • Vibrate the concrete filled in moulds to the required time correctly • Cure the demoulded cubes to the required period	• Weigh the material accurately • Vibrate the concrete filled in moulds to the required time correctly
10	Testing of cement concrete cubes for compression	• Apply the load at required rate correctly • Record the load at FAILURE accurately • Calculate the compressive strength accurately	• Apply the load at required rate correctly
11	Split Tensile Strength of concrete	• Apply the load at required rate correctly • Record the load at FAILURE accurately • Calculate the split tensile strength accurately	• Apply the load at required rate correctly • Calculate the split tensile strength accurately
12	Design mix of concrete proportion	• Calculate the proportions of material correctly • Weigh the ingredients of concrete accurately as per design mix calculations	• Calculate the proportions of material correctly
13	Non-destructive tests on concrete	• Applying the load at required rate as per procedure correctly • Calculating the strength of hardened concrete from graphs accurately	• Applying the load at required rate as per procedure correctly
14	Sieve Analysis – Classification of soil	• Arrangement of sieves in correct order • Sieving the soil to the required time • Weigh of residue in each sieve accurately	

15	Atterberg Limits	• Weigh the material accurately • Prepare the soil sample and place in the mould correctly • Count the blows correctly • Record the readings accurately • Draw the graphs accurately	
16	Field Density of soil(Sand Replacement Method)	• Calibrate the apparatus correctly • Weigh the samples accurately • Calculate the density accurately	• Calibrate the apparatus correctly • Weigh the samples accurately
17	Proctor Compaction Test	• Weigh the soil correctly • Measure the water accurately • Apply required no. of blows of compaction accurately • Record the observations correctly • Draw graph correctly	• Weigh the soil correctly • Measure the water accurately • Draw graph correctly

COURSE CONTENT

1. Tests on aggregate

a. Specific Gravity of fine and coarse aggregate
b. Impact value of coarse aggregate
c. Crushing value of coarse aggregate
d. Abrasion value of coarse aggregate
e. Flakiness index of coarse aggregate
f. Elongation index of coarse aggregate

2. Tests on concrete

a. Workability test by Slump Cone Test
b. Workability test by Compaction factor test
c. Casting of Cement concrete cubes
d. Testing of Cement concrete cubes for compression
e. Split tensile strength of concrete
f. Design mix of concrete proportion

3. Non-destructive tests on concrete

a. Surface hardness of concrete by Rebound hammer test
b. Ultrasonic Test

4. Tests on Soil

a. Sieve analysis-classification of soil.
b. Atterberg Limits
c. Field density of soil by sand replacement method
d. Proctor Compaction Test

REFERENCE BOOKS:

1. Concrete Technology, M.S. Shetty & A.K. Jain, S.CHAND Publication
2. Concrete Technology, M.L. Gambhir , McGrawHill Publications.
3. Soils Mechanics and Foundations, B.C. Punmia, Dr. Ashok K. Jain &Dr. Arun K. Jain, Laxmi Publications
4. Engineering Properties of soils and their measurement, Joseph E. Bowles, McGraw Hill Book Company.

C23-C-408: English Communication Skills (Lab Practice)

Course Title : English Communication Skills	**Course code: C23-C- 408 (Common to all Branches)**
Year/ Semester : IV Semester	**Number of Periods : 45 (3 periods per week)**
Type of Course : Practical	**Max Marks : 100 (Internal 40 + External 60)**

Course Objectives:	- to communicate effectively in diverse academic, professional and everyday situations
	- exhibit appropriate body language and etiquette at workplace
	- be employable through preparing appropriate job applications and attend interviews confidently with all necessary skills

CO No.	
CO1	Listen and comprehend the listening inputs related to different genres effectively
CO2	Communicate effectively in interpersonal interactions, interviews, group discussions and presentations
CO3	Acquire employability skills: job hunting, resume writing, attending interviews
CO4	Practise appropriate body language and professional etiquette

Course Delivery: Text book: **"English Communication Skills"**
by State Board of Technical Education and Training, AP

Sl No	**Unit**	**Teaching Hours**
1	Listening Skills	6
2	Workplace Etiquette	3
3	Introducing Oneself	3
4	Short presentation (JAM)	6
5	Group Discussion	6
6	Resume Writing and Cover Letter	3
7	Interview Skills	9
8	Presentation Skills	9
Total		*45*

Course Content:

UNIT I:Listening Skills **6 periods**

Pre – While- Post-listening activities- Listening to audio content (dialogues/ speech/ narrations) - answering the questions and fill in the blanks- vocabulary

UNIT 2: **Workplace Etiquette** **3 periods**

Basics of Etiquette- politeness/ courtesy, good manners- features of work place etiquette- adaptability, positive attitude, body language.

UNIT 3: Introducing Oneself **3 periods**

Speak about oneself - introduce oneself to a gathering/ formal & informal situations- Know about others- filling in the grid- introducing oneself in interviews

UNIT 4: Short Presentation **6 periods**

Dos and Don'ts in short presentation- speak for a minute without repetition, deviation & hesitation - the techniques to speak fluently – defining and describing objects, people, phenomena, events.- speaking on randomly chosen topics.

UNIT 5: Group Discussion **6 periods**

Fundamentals of Group Discussion- Dos and Don'ts- filling the Grid- possible list of topics- practice sessions- sample videos-Group activity

UNIT 6: Resume Writing and Cover Letter **3 periods**

Pre activity: answer the questions- jotting down biographical information- sample resumes- tips, Dos and Don'ts- model resumes- practice exercises on Resume writing

UNIT 7: Interview Skills **9 periods**

Pre –while-post activities: - things to do at three stages – respond to notifications- know the information about the organisation-practice FAQs - preparation of good/ suitable C V, Body language, tips for success in interviews, model / mock interviews.

UNIT 8: Presentation Skills **9 periods**

Preparatory work: observe pictures and answer questions- different kinds of presentations- PPTs, Flash cards, Posters, Charts. - tips to prepare aids, slide show, model PPTs, - checklist on pre, while and post presentations.

Mapping Course Outcomes with Programme Outcomes:

PO	**1**	**2**	**3**	**4**	**5**	**6**	**7**
CO	**POs 1 to 5 are applications of Engineering Principles, can't be directly mapped to English Communication Skills**					**1,2,3,4**	**1,2,3,4**

Unit wise Mapping of CO –PO

CO	**Course Outcome**	**COs / Unit Mapped**	**POs** mapping	**Cognitive levels as per Bloom's Taxonomy R/U/A/An (Remembering / Understanding / Applying/ Analysing)**
CO 1	Listen and comprehend listening inputs related to different genres effectively	Unit 1	6,7	R/U/A
CO2	Communicate effectively in interpersonal interactions, interviews, group discussions and presentations	Units 3,4,5,7,8	6,7	R/U/A/An
CO3	Acquire employability skills: job hunting, resume writing, attending interviews	Units 6,7	6,7	R/U/A/An
CO4	Practise appropriate body language and professional etiquette	Units 2, 3, 4,5,7,8	6,7	R/U/A

SURVEYING – III PRACTICE

Course code	Course Title	No. of periods/week	Total No. of periods	Marks for Formative Assessment	Marks for Summative Assessment
C-409	Surveying-III Practice	03	45	40 (30 for class exercises + 10 for survey camp)	60

S.No.	Major Topics	No. of Periods
1	Field Exercises using Total Station	36
2	Global Positioning System	6
3	Digitization of Maps	3
	Total	45
4	Survey camp for 3 days during 6 AM to 12 noon & 2PM to 5 PM on each day immediately after completion of exercises on Total station (25% of total sessional marks shall be allocated to this activity)	3 days (additional instructional duration & NOT to be included in the above 60 periods)

Survey Camp: one of the following Surveying activity involving Total Station operations shall be allotted to one or two batches of the students:

- ***a) Land Survey***
- ***b) Road Survey***
- ***c) Contour Survey***
- ***d) Other Surveys***

COURSE OBJECTIVES:

Upon completion of the course the student shall be able to		
Course Objectives	(i)	Develop knowledge about Modern surveying instruments & methods adopted to carry out Field Survey with a professional approach.
	(ii)	Develop skills in students in using Total Station, GPS and acquire knowledge in digitization of Maps

COURSE OUTCOMES:

Course Outcomes	CO1	C-409.1	Apply the knowledge of Total Station in different operations in Civil Engineering projects
	CO2	C-409.2	Perform precise operations/skills involved in using GPS and digitization of Maps.

LEARNING OUTCOMES:

Learning Outcomes	**1.0. Field Exercises using Total Station** 1.1 Study of component parts, accessories and functions Total Station, Initialization of Total Station over ground station and measure the distance between two given points, Measure area of given field. 1.2 Conduct traversing survey (closed Traverse). 1.3 Find the Height and width of an elevated object. 1.4 Determine the elevation of Instrument point by making observation to point with known elevation and measure multiple sets (rounds) of observations. 1.5 Perform a station setup on a known point by making observations to one or more back sight points and establish the position of an occupied point relative to a base line or a boundary line. 1.6 Mark or establish points, Lines and Arcs on the ground. 1.7 Mark Centre line of a building on the ground. 1.8 Conduct survey for L.S and C.S of a proposed road/canal/pipe line on the ground. 1.9 Perform post processing. 1.10 Plot contour map of an area using surfer software. **2.0. Global Positioning System** 2.1 Identify the components and the functions of Global Positioning System. 2.2 Determine the Coordinates of various points on the ground. 2.3 Perform the linking the G.P.S data with Total Station. **3.0. Digitization of Maps** 3.1 Study the concept of digitization. 3.2 Digitization of any given contour map Using the available soft wares 3.3 Digitization of given Town map and creating different layers for roads, railways, water supply lines and drainage lines etc., Using the available soft wares

PO-CO Mapping:

Course Code: CE-409	Course Title: SURVEYING –III Practice No.of COs: 02				No. of Periods: 45
POs	Mapped with CO Nos.	CO periods addressing PO in Col.1		Level (1,2,3)	Remarks
		No.	%		
PO1	CO1, CO2	6	10	1	>40% Level 3 (Highly Addressed)
PO2	CO1, CO2	6	10	1	
PO3	CO1, CO2	24	43	3	25% to 40% Level 2 (Moderately Addressed)
PO4	CO1, CO2	14	25	2	
PO5	CO1, CO2	5	9	1	5% to 25% Level 1 (Low Addressed)
PO6	CO1, CO2	5	9	1	
PO7					<5% Not Addressed

CO-PO Mapping:

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2	2	3	2	2	2	3	2	3
CO2	2	3	3	2	2	3	2	3	2	3
Average	2	2.5	2.5	2.5	2	2.5	2	3	2	3

Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits ..etc.

COURSE CONTENT

1.0 Field Exercises using Total Station

a) Study of component parts, accessories and functions Total Station, Initialization of Total Station over ground station and measure the distance between two given points, Measure area of given field.
b) Conduct traversing survey (closed Traverse).
c) To find Height and width of an elevated object.
d) To determine the elevation of Instrument point by making observation to point with known elevation, to measure multiple sets (rounds) of observations.
e) To perform a station setup on a known point by making observations to one or more back sight points and to establish the position of an occupied point relative to a base line or a boundary line.
f) To mark or establish points, Lines and Arcs on the ground.
g) To mark Centre line of a building on the ground.
h) L.S and C.S of proposed road/canal/pipe line on the ground.
i) Understand post processing.
j) To plot contour map of an area using surfer software.

2.0 Global Positioning System

a) Identifies the components and the functions of Global Positioning System.
b) Determines the Coordinates of various points on the ground.
c) Linking the G.P.S data with Total Station.

3.0 Digitization of Maps

a) Study the concept of digitization.
b) Digitization of any given contour map Using the available soft wares
c) Digitization of given Town map and creating different layers for roads, railways, water supply lines and drainage lines etc., Using the available soft wares

KEY competencies to be achieved by the student

S.NO.	Experiment Title	Key Competency
1	Field Exercises using Total Station a) Ex 1.1 b) Ex 1.2 c) Ex 1.3 d) Ex 1.4 e) Ex 1.5 f) Ex 1.6 g) Ex 1.7 h) Ex 1.8 i) Ex 1.9	• Places total station on tripod, checks batteries and switches on total station • Centering of total station over a given point and sighting reflecting prism to measure distance • Measure area of given field • Conduct traversing survey (closed Traverse) and gets plotting • Finds Height and width of an elevated object • Finds the elevation of Instrument point by making observation to point with known elevation • Understands errors by taking multiple sets (rounds) of observations • Knows station setup on a known point by making observations to one or more back sight points

		• Establish the position of an occupied point relative to a base line or a boundary line • Establish points, Lines and Arcs on the ground • Locates Centre line of a building on the ground • Collects data for L.S and C.S of proposed road/canal/pipe line on the ground • Understand post processing • Plots contour map of an area using SURFER software
2	Global Positioning System a) Ex 2.1 b) Ex 2.2 c) Ex 2.3	• Identifies the parts and the functions and learns operating GPS • Determines the Coordinates of various points on the ground • Linking the G.P.S data with Total Station
3	Digitization of Maps a) Ex 3.1 b) Ex 3.2 c) Ex 3.3	• Understands software • Digitizes of any given contour map using available software. • Digitizes of given Town map and creating different layers for roads, railways, water supply lines and drainage lines etc., Using the available software.

CAD PRACTICE – II

Course code	Course title	No. of period/week	Total no. of periods	Marks for Formative Assessment	Marks for Summative Assessment
C-410	CAD PRACTICE-II	03	45	40	60

S. No.	Major Topics	No. of Periods	COs Mapped
1.	Culverts and Bridge Drawings	15	CO1
2.	Public Health Engineering Drawings	15	CO2
3.	Irrigation Engineering Drawings	15	CO3
	Total	45	

COURSE OBJECTIVES:

Upon completion of the Course, the student shall be able to	
Course Objectives	Gain the skills in drawing of different Engineering Structures such as Culverts, Bridges, Public health and Irrigation Engineering Drawings using CAD software.

COURSE OUTCOMES:

Course Outcomes	CO 1	C-410.1	Draw different views of culverts and bridges.
	CO 2	C-410.2	Draw the Components of Public health Engineering Structures
	CO 3	C-410.3	Draw the different views of Irrigation Engineering Structures

LEARNING OUTCOMES:

Learning Outcomes	**1.0 Culverts and Bridge Drawings** 1.1 Draws the plan,cross sectional elevation and longitudinal sectional elevation of pipe culverts, R.C.C.- slab culvert and identifies the component parts from the given set of specifications. 1.2 Draws the sectional elevation, plan and cross section of two span R.C.C. T-beam bridges from the given set of specifications. **2.0 Public Health Engineering Drawings** 2.1 Draws the sectional elevation, plan and cross-section of public health engineering works : Septic Tank, RCC Overhead tank (Square) 2.2 Draw the Layout of water supply and drainage connections in residential buildings. **3.0 Irrigation Engineering structure Drawings** 3.1 Draw the sectional elevation, plan and cross section of Earthen bunds –Homogeneous and Non Homogeneous 3.2 Tank surplus weir with splayed wing walls 3.3 Canal drop (notch type) 3.4 Tank sluice with tower head. 3.5 Canal regulator

PO-CO MAPPING:

Course Code : C-410	**Course Title: CAD PRACTICE-II** **Number of COs: 03**				**No. of Periods: 45**
POs	**Mapped with CO No.**	**CO Periods addressing PO in Column 1**		**Level (1,2,3)**	**Remarks**
		No	**%**		
PO1	CO1, CO2, CO3, CO4,CO5	11	26	2	> 40% Level 3 Highly addressed
PO2	CO1, CO2, CO3, CO4, CO5	05	11	1	
PO3	CO1, CO2, CO3, CO4, CO5	05	11	1	

PO4	CO1, CO2, CO3, CO4, CO5	18	40	3	25% to 40% Level 2 Moderately addressed
PO5	CO1, CO2, CO3, CO4, CO5	03	7	1	
PO6					
PO7	CO1, CO2, CO3, CO4, CO5	3	5	1	5 to 25% Level 1 Low addressed

CO-PO MAPPING:

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO 3
CO1	2	3	3	2	3		2	2	2	3
CO2	2	3	2	3	3		2	2	2	3
CO3	3	2	2	3	2		2	2	2	3
CO4	2	2	2	2	2		2	2	2	3
CO5	3	3	3	2	2		2	2	2	3
Average	2.4	2.6	2.4	2.4	2.4		2	2	2	3

Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz

(vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc

COURSE CONTENT

1.0 Culverts and Bridge Drawings

Preparation of Plan, cross sectional elevation and longitudinal sectional elevation of

a. Pipe Culvert (Single Pipe)
b. R.C.C. slab culvert with square returns
c. Two-span R.C.C. T-beam bridge with square walls.

2.0 Public Health Engineering Drawings

Preparation of Layouts of water supply & Sanitary lines in buildings

a. Sanitary block of a large building showing internal water supply and sanitary fittings and plumbing fixtures (Plan & Section across each unit)
b. Water supply & sanitary connections to a residential building
c. Septic tank with details of connection to a residential building.
d. R.C.C overhead square tank(four columns with accessories).

3.0 Irrigation Engineering Drawings

Preparation of Plan,cross sectional elevation and longitudinal sectional elevation of

a. Earthen bunds –
   a) Homogeneous b) Non Homogeneous (Zoned embankment)
b. Tank surplus weir with splayed wing walls
c. Canal drop (notch type)
d. Tank sluice with tower head.
e. Canal regulator.

V SEMESTER

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTION AND MODEL BLUE PRINT FOR EVALUATION
CURRICULUM-2023

FIFTH SEMESTER

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods Per Year	Scheme Of Examination			
		Theory	Practical		Duration (hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY								
C-501	Steel Structures	4		60	3	20	80	100
C-502	Environmental Engineering	5		75	3	20	80	100
C-503	Quantity Surveying	5		75	3	20	80	100
C-504	Advanced Civil Engineering Technologies	4		60	3	20	80	100
C-505	Construction Management &Entrepreneurship	3		45	3	20	80	100
PRACTICAL								
C-506	Structural Engineering Drawing		4	60	3	40	60	100
C-507	Field Practices		4	60	3	40	60	100
C-508	Life Skills		3	45	3	40	60	100
C-509	Computer Applications in Civil Engineering		4	60				
C-510	Project work		3	45	3	40	60	100
	Student centric learning		3	45				
	Total	**21**	**21**	**630**		**280**	**720**	**1000**

[Note: C-508 is Common with all Branches]

STEEL STRUCTURES

Course code	Course title	No. Of period/week	Total no. Of periods	Marks for Formative Assessment	Marks for Summative Assessment
C-501	Steel Structures	04	60	20	80

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. of Periods	Weightage of marks	No. of Short Answer Questions	No. of Essay Questions	COs Mapped
1.	Introduction and Fundamentals of Limit State Design of Steel structures	04	3	1	-	CO1
2.	Design of fillet welded joints	10	26	2	2	CO2
3.	Design of Tension members	10	26	2	2	CO3
4.	Design of Compression members, Columns &Column bases	17	26	2	2	CO4
5.	Design of Beams	15	26	2	2	CO5
6.	Roof Trusses	4	3	1	-	CO5
	Total	60	110	10	8	

COURSE OBJECTIVES:

Upon completion of the course the student shall be able to		
Course Objectives	(i)	Understand the fundamentals of Limit state design of steel structures and design aspects of fillet welded joint.
	(ii)	Design tension members, compression members and flexural members by following IS Codal provisions.

COURSE OUTCOMES:

Course Outcomes	CO 1	C-501.1	Explain the fundamentals of limit state design of steel structures.
	CO 2	C-501.2	Design Fillet Welded Joints
	CO 3	C-501.3	Design of Tension Membersin Steel Structures
	CO 4	C-501.4	Design Compression Members, Columns and Column bases
	CO 5	C-501.5	DesignSteel Beams and State differenttypes of roof trusses and their suitability

LEARNING OUTCOMES:

Learning Outcomes	**1.0 Introduction and fundamentals of limit state design of steel structures** 1.1 State common types of steel structures,their merits and demerits. 1.2 List the loads considered in the design of steel structures as per I.S:875-1987 and describe them 1.3 Understand the code of practice I.S. 800-2007 1.4 List physical and mechanical properties of structural steel. 1.5 Sketch different types of rolled steel sections and explain its classification based on their cross sections. 1.6 List types of elements. 1.7 Explain the concept of Limit State Design, define 'limit state' and state the types. 1.8 Define Characteristic action, Design action and Design strength. 1.9 State the partial safety factor values for loads in limit state of strength and serviceability and for materials in limit state. 1.10 State the deflection limits for Simply supported beam, Cantilever beam and Purlins **2.0 Design of Fillet Welded Joints** 2.1 State different types of joints. 2.2 Differentiate the welded joints and Riveted joints

	2.3 Sketch the different forms of welded joints. 2.4 Explain the features of a fillet welded joint. 2.5 State stresses in welds as per I.S.800-2007. 2.6 State formula for design strength of a fillet welded joint. 2.7 Calculate the design strength of a fillet welded joint. 2.8 Design a fillet welded joint for a given load, thickness of a plate and permissible stresses as per code.Design a fillet welded joint for a single angle connected to the gussetplate by fillet welds along the sides and at ends carrying axial loads.Design a fillet welded joint for a double angle connected to the gussetplate by fillet welds along the sides and at ends carrying axial loads. **3.0 Design of Tension Members** 3.1 Define ' tie' 3.2 State the applications of tension members. 3.3 Sketch different forms of tension members and understand their behaviour of tension members. 3.4 State and describe different modes of failures of tension members with sketches 3.5 State the maximum values of effective slenderness ratios as per code. 3.6 Determine the net effective area of single angle connected to gusset plate by welding. 3.7 Determine the design strength due to yielding of gross section, rupture of critical section and block shear failure of a single angle connected by welding 3.8 Understand design procedure of tension members. Design a single angle tension member connected by welding only. **4.0 Design of Compression Members, Columns and Column bases** 4.1 Understand, State and sketch different types of compression members (like column, strut) 4.2 Sketch different forms of compression members and understand and theirbehaviour and state the classification of cross sections. 4.3 Define the terms 1. Least radius of gyration and 2. Slenderness Ratio and distinguish between actual length and effective length and also state effective lengths to be used for different end conditions. 4.2 Understand buckling class of cross section based on Imperfection factor, stress reduction factorandcolumn buckling curves and state maximum

	values of effective slenderness ratios as per code 4.3 Understand the design compressive stress for different column buckling Classes, Determine the design strength of compression members 4.4 Understand design procedure of compression members and design of columns with I sections and built-up channel sections. 4.5 Understand design details , effective sectional area , codal provisions for angle strutsanddesign single angle and double angle struts. 4.6 Understand codal provisions of lacing and battening systems for built-up columns. 4.7 Design a slab base along with a cement concrete pedestal and also design the welded connection. **5.0 Design of Steel Beams** 5.1 Understand the concept of limit state design of beams , Define the terms: Elastic moment of resistance, Plastic moment of resistance, Elastic section modulus, Plastic section modulus and Shape factor. 5.2 Determine the shape factor values for rectangular, Tee and I-sections. 5.3 Understand the behaviour of steel beams, Classify beams based on lateral restraint of compression flange. 5.4 Determine the design strength in bending (flexure) and in shear of laterally supported beams and list the factors affecting lateral stability and influence of type of loading. 5.5 Distinguish between web buckling and web crippling and understand the failure of beams by flexural yielding and list the types of failure of beams by flexural yielding 5.6 Understand laterally supported beam, holes in tension zone, shear lag effects and design bending strength. 5.7 Understand laterally unsupported beam, lateral torsional buckling of beams (theoretical concept only – no problems) and explain effective length of compression flanges. 5.8 Understand concept of shear in beams and resistance to shear buckling., shear buckling design methods like Simple post critical method and Tension field method and also understand the design of simple beams with solid webs. 5.9 Understand component parts of plate girders with sketches and describe

	different types of Stiffeners with their suitability. 5.10 Design laterally supported simply supported beam considering all codal requirements. **6.0 Roof Trusses** 6.1 List types of trusses viz., Plane trusses and Space trusses. 6.2 Understand the situations where roof trusses are used. 6.3 Sketch different types of roof trusses with their suitability for a given span. 6.4 Sketch a roof truss and name the component parts. 6.5 Understand the configuration of trusses like Pitched roof and Parallel chord trapezoidal trusses. 6.6 Understand cross sections of truss members. 6.7 Understand the loads on roof trusses as per I.S – 875-1987 6.8 Calculate the live load on roof covering and live load on truss.

PO-CO Mapping:

Course Code : C-501	**Course Title: Steel Structures** **Number of Cos: 05**				**No. Of Periods: 60**
PO #	**Mapped with CO #**	**CO Periods addressing PO in Column 1**		**Level (1,2,3)**	**Remarks**
		No	**%**		
PO1	CO1, CO2, CO3, CO4, CO5	24	40	3	**> 40% Level 3 Highly addressed** **25% to 40% Level 2 Moderately addressed** **5 to 25% Level 1 Low addressed**
PO2	CO1,CO2,CO3, CO4, CO5	24	40	3	
PO3	CO2,CO3,CO4,CO5	6	10	1	
PO4					
PO5	CO2,CO3,CO4,CO5	6	10	1	
PO6					
PO7					

CO-PO Mapping:

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	3				1	3	3	3
CO2	2	3	2				1	3	3	3
CO3	2	3	2				1	3	3	3
CO4	2	3	1				1	3	3	3
CO5	3	2	2							
Average	2.4	2.6	2				1	3	3	3

Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz

(vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc

COURSE CONTENT

1. **Introduction and fundamentals of limit state design of steel structures**

   Merits and demerits of steel structures – Loads considered in the design of steel structures as per I.S:875 -1987 – Introduction to I.S. 800-2007 – Mechanical properties of structural steel – yield stress (f_y), ultimate tensile stress (f_u) and maximum percent elongation (table -1 of IS:800-2007) – Standard structural sections – Classification of cross sections – class 1(plastic) class2(compact) class3(semi compact) and class4(slender) – types of elements – internal elements, outstands and tapered elements – Concept of Limit State Design – limit state of strength – limit state of serviceability – classification of actions – strength – partial safety factors for loads and materials – deflection limits.

2. **Design of Fillet Welded Joints**

   Different types of joints – lap joints – butt joints – Differentiation of welded joints and riveted joints – Different forms of welded joints – sketches of fillet and butt weld joints – Fillet welded joint – detailed sketch showing the component parts – Stresses in welds as per I.S.800-2007 – Codal requirements of welds and welding – Problems on calculation of strength of a fillet welded joint – Design of fillet welded joint for a given load, thickness of a plate and permissible stresses as per code – Design of fillet welded joint for single or double angles carrying axial loads.

3. **Design of Tension Members**

   Introduction – different forms of tension members – Behaviour of tension members – Different modes of failures – gross section yielding, net Section rupture and block shear failure – Maximum values of effective slenderness ratios as per code –

Calculation of net effective sectional area of single angle with welded connection only – Calculation of the design strength due to yielding of gross section, rupture of critical section and block shear – problems on single angle with welded connection only – Design procedure of tension members – Problems on design of tension members single angle with welded connection only.

4. **Analysis and design of Compression Members, columns and column Basis**
   Introduction – different forms of compression members – Behaviour of compression members – classification of cross sections – class 1 (plastic), class2 (compact), class3 (semi compact) and class4 (slender) – Effective lengths to be used for different end conditions – table 11 of I.S:800 – Buckling class of cross section – imperfection factor and stress reduction factor for different buckling classes – column buckling curves – Maximum values of effective slenderness ratios as per code – design compressive stress for different column buckling classes – Calculation of design strength of compression members – problems – Design procedure of compression members – problems on simple sections only (no built-up sections) – Design details – effective sectional area – codal provisions for angle struts – single angle and double angle – discontinuous and continuous struts –Codal provisions of single / double lacing and battening for built-up columns (no problems) – Design of slab base along with a cement concrete pedestal, design of welded connection of base plate and column – problems.

5. **Analysis and design of Steel Beams**
   Concept of limit state design of beams – shape factor and plastic properties of beams – Problems on shape factor – Behaviour of steel beams – design strength in bending (flexure) – Factors affecting lateral stability – influence of type of loading – web buckling and web crippling – Beams failure by flexural yielding – Laterally supported beam – holes in tension zone – shear lag effects – design bending strength – lateral torsional buckling of beams – (theoretical concept only – no problems) – Effective length of compression flanges - Concept of shear in beams – resistance to shear buckling – Shear buckling design methods – simple post critical method – tension field method – Design of laterally supported simple beams with solid webs – Component parts of plate girders with sketches – brief description of different types of stiffeners - Design of laterally supported simply supported beam considering all codal requirements.

6. **Design of Roof Trusses**
   Types of trusses – plane trusses, space trusses – Sketches of different roof trusses with their suitability for a given span – Cross sections of truss members – Loads on roof trusses as per I.S. 875 -1987 –Determination of live load given pitch of the truss.

REFERENCE BOOKS:

1.IS 800-2007 –Indian Standard General construction in steel – code of practice

2. Design of Steel Structure by N Subramanian, Oxford University Press, New Delhi.

3.Limit state design of steel structures by S K Duggal, Tata McGraw Hill Education, New Delhi

4. Fundamentals of structural steel design M L Gambhir, Tata McGraw Hill Education Private Limited, New Delhi

5. Steel Structures: Design and Practice by N Subramanian,Oxford Publishers, New Delhi

6. Design of steel structure by Limit State Method as per IS 800- 2007 by Bhavikatti S S, I.K. International Publishing House, New Delhi

7. Limit state design of Steel Structure by Ramchandra & Gehlot, Scientific Publishers, Pune.

8. Teaching Resource Material : http://www.steel-insdag.org

Table specifying the scope of syllabus to be covered for Unit Test-I & Unit Test -II

Unit Test	Learning Outcomes to be covered
Unit Test–I	From1.1to3.10
Unit Test –II	From4.1to6.8

ENVIRONMENTAL ENGINEERING

Course code	Course Title	No. Of periods/week	Total No. Of periods	Marks for Formative Assessment	Marks for Summative Assessment
C-502	Environmental Engineering	05	75	20	80

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. of Periods	Weightage of marks	No. of Short Answer Questions	No. of Essay Questions	COs Mapped
1	Water Supply Scheme & Sources and Conveyance of Water	12	13	1	1	CO1
2	Quality and Purification of Water	16	26	2	2	CO2
3	Distribution system and water supply arrangements in a Building	8	13	1	1	CO2
4	Introduction to Sanitary Engineering & Quantity of Sewage	6	13	1	1	CO3
5	Laying of Sewers & Sewer	7	13	1	1	CO3

	appurtenances					
6	Characteristics of Sewage, treatment & disposal	14	26	2	2	CO4
7	Rural Water Supply and Sanitation	8	3	1	-	CO5
8	Air Pollution	4	3	1	-	CO5
	Total Periods	75	110	10	8	

COURSE OBJECTIVES:

Upon completion of the course the student shall be able to		
Course Objectives	(i)	Familiarise with basic knowledge on environment and ecology, history of water supply, Understand the sources, quality & quantity, collection, conveyance, testing and treatment techniques of water.
	(ii)	Understand the storage, distribution and water supply arrangements in buildings.
	(iii)	Learn basic knowledge of the sanitary Engineering, Sewerage works, methods of sewage collection, basic concepts of design of sewers, their laying with appurtenances
	(iv)	Explain the methods of sewage treatment and disposal, methods of solid waste collection & disposal and sanitation in buildings, in Rural areas and fundamentals of air pollution.

COURSE OUTCOMES:

Course Outcomes	CO1	C-502.1	Explain the terms (i) Environment and ecology (ii) Water supply scheme (iii) Per capita demand (iv) Sources (v) conveyance of water
	CO2	C-502.2	Explain the quality and treatment of water, systems of distribution, methods of water supply and water supply arrangements in buildings
	CO3	C-502.3	Describe the basics of sanitary engineering, sewer design, laying of sewers and sewer appurtenances.
	CO4	C-502.4	Explain the methods of Sewage treatment and disposal
	CO5	C-502.5	Discuss (i) Methods of disposal of solid waste (ii) Sanitation in Building (iii) Rural water supply and sanitation(iv) Fundamentals of air pollution.

LEARNING OUTCOMES:

Learning Outcomes	
	1. Water supply scheme, Sources and conveyance of water 1.1. Explain the importance and development of water supply 1.2. States the need for protected water supply, objectives of protected water supply scheme and draw the flow chart of a typical water supply scheme of a town. 1.3. List the factors affecting per capita demand of a town/city and state the requirements of water for various purposes: Domestic purpose, Industrial use, Firefighting, Commercial and institutional needs and public use. Explain the variation in demand for water supply. 1.4. Estimate the quantity of water required by different towns, State the need and methods of forecasting population, Solve problems on forecasting population by different methods. 1.5. State the common sources of water for a water supply scheme, different types of surface & sub surface sources of water, merits and demerits of surface and sub surface water sources, salient features of surface sources. 1.6. Define Aquifer, Aquiclude and Ground water table, classify wells according to construction, Define Draw down, Critical depression head, Circle of influence, Cone of depression, Confined aquifer, unconfined aquifer and Specific yield, Explain the procedure for determining yield of a well by pumping tests (Constant Pumping and Recuperation Tests). 1.7. Explain with sketches: Infiltration galleries and Infiltration wells 1.8. Explain intakes for collection of water (reservoir intake, river intake, canal intake and Lake Intake) with sketches. 1.9. Explain different methods of conveyance of water, merits and demerits of different types of pipes, different joints used for connecting pipes with sketches, method of Pipe laying and testing. **2. Quality and purification of water** 2.1. State different types of impurities, need for laboratory tests, explain the method of obtaining samples for testing, different tests for analysing quality of water with their significance. 2.2. Define: Ecoli index and Most Probable Number (MPN), State the significance of Ecoli in water analysis, Explain the importance of chemical and bacteriological analysis of water used for domestic purpose. 2.3. State the various water borne diseases in India, State the maximum acceptable limits of Turbidity, Hardness, Nitrates and Fluorides for the public drinking water. 2.4. State the objectives of treatment of water, Sketch the layout of a water treatment plant indicating the different stages, List the points to be considered in locating a treatment plant. 2.5. State the objectives and explain the process of Aeration, Plain sedimentation, Sedimentation with coagulation, Filtration and Disinfection. 2.6. Describe different types of sedimentation tanks.

	2.7. Describe the construction and operation of slow sand filters, Rapid sand filters and pressure filters and compares them. 2.8. Define disinfection of water, Explain the need for disinfecting water, methods of disinfection of water and types of Chlorination. 2.9. List the substances responsible for causing colour, taste and odour, Explain the temporary hardness and permanent hardness, various methods of removal of hardness. **3. Distribution system and Water supply arrangements in Buildings** 3.1. State the requirements and classification of distribution system, explain different systems of distribution with sketches 3.2. List and explain the different methods of water supply system and state their merits and demerits. 3.3. State the necessity for service reservoirs, Draw sketches of rectangular overhead service reservoir showing all accessories. 3.4. Explain with sketches the different layouts in distribution system, state their merits and demerits and their suitability for a given locality. 3.5. List and Explains with sketches the location and functioning of various appurtenances used in a distribution system. 3.6. Explain methods of detecting leakages, methods of rectification and prevention of leakages in water supply mains. 3.7. Define terminology used while making water supply arrangements in buildings, State the principles in laying pipelines within the premises of a building. 3.8. Explain the general layout of water supply connections of buildings, explain water Supply arrangements for single and multi-storeyed buildings as per I.S. Code. 3.9. State the general precautions to be taken in plumbing work for buildings. 3.10. Explain the water supply connection to a building from a water main and uses of different fittings: ferrule, goose neck, stopcock. **4. Introduction to Sanitary Engineering and Quantity of sewage** 4.1. State the objectives of sewage disposal works. 4.2. Define the terms: Sewage, Sewer and Sullage, Sewerage, Refuse and Garbage 4.3. List the objectives of sewerage works and explain various methods of sewage collection works and compare them. 4.4. Explain the different sewerage systems, compare them, discus their suitability 4.5. State the main constituents of sewage for calculating quantity, define Dry weather flow, discuss the factors affecting, state the factors affecting the quantity of storm sewage and explain the variation in rate of sewage. 4.6. Estimate the quantity of storm water flow using 1. Rational method and 2. Empirical formulae. 4.7. List the requirements of good surface drains, explain different types of surface drains with their merits and demerits.

	5. Laying of sewers and Sewer appurtenances 5.1. State various shapes of sewers, explain them with sketch, discuss their merits and demerits. 5.2. Mention different materials used for sewers discuss their merits and demerits. 5.3. Explain the method of laying the sewers as per given alignment, the necessity of providing sewer appurtenances on the sewer lines. 5.4. Explain the construction, function and location of the different sewer appurtenances. 5.5. State the situations under which sewage pumping is necessary,explain the component parts of a pumping station and factors influencing its location. 5.6. Explain the construction and working of Shone's ejector with the help of a sketch. 5.7. Describe the testing of sewers. **6. Characteristics of sewage, Treatment and disposal** 6.1. Define strength of sewage, describe the method of sampling sewage. 6.2. State the physical, chemical and biological characteristics of sewage. 6.3. Define C.O.D and B.O.D. State the significance of tests like i) Total Solids (ii) C.O.D. (iii) B.O.D. (iv) PHValue (v) Chlorides. 6.4. State the characteristics of industrial waste water, explain the principles of treatment of industrial waste water. 6.5. State the objects of sewage treatment. Draw the conventional sewage treatment plant of a town and indicate the units. 6.6. State the function of screens, skimming tanks and grit chambers and explain their working. 6.7. Explain with sketch wherever necessary the treatment works: Sedimentation tank, Trickling filters, Activated sludge process, Oxidation ditch, Oxidation Pond, Aerated lagoons, Anaerobic lagoons, Sludge digesters 6.8. Compare activated sludge process and trickling filters. List out various methods of sludge disposal and briefly explain them. 6.9. Explain with sketch the treatment of sewage by septic tank and soak pit. 6.10. List and explain the various methods of sewage disposal. **7. Rural water supply and sanitation** 7.1. Explain the process of disinfection of wells by two pot method. 7.2. Explain the methods of rural sanitation. 7.3. Describe with sketches the construction of sanitary latrines in rural areas. 7.4. State the advantages of biogas plant, factors on which the production of biogas depends, describe the construction and working of K.V.I.C. model and Janata model biogas plant with a neat sketch. 7.5. State Vermi composting and explain the procedure of Vermi composting and mention its advantages. **8. Air pollution**

	10.1 Define the term air pollution, state and explain the sources of air pollution. 10.2 Explain the effects of air pollution on human health & vegetation and on atmosphere & materials. 10.3 State methods of control of air pollution. 10.4 State various types of controlling devices and equipment.

PO-CO Mapping:

Course Code : C-502	**Course Title: Environmental Engineering** **Number of Cos: 05**				**No. Of Periods: 75**
PO #	**Mapped with CO #**	**CO Periods addressing PO in Column 1**		**Level (1,2,3)**	**Remarks**
		No	%		
PO1	CO1, CO2, CO3, CO4, CO5	30	40	3	**> 40% Level 3 Highly addressed** **25% to 40% Level 2 Moderately addressed** **5 to 25% Level 1 Low addressed**
PO2	CO1, CO3, CO4, CO5	20	27	2	
PO3	CO2, CO3, CO4, CO5	13	17	1	
PO4	CO5	6	8	1	
PO5	CO1, CO5	6	8	1	
PO6	-	-	-	-	
PO7	-	-	-	-	

CO-PO Mapping:

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	3			2			2	3	2
CO2	3		1					2	3	2
CO3	3	2	1					2	3	2
CO4	3	2	1					2	3	2
CO5	2	1	2	1	2			2	3	2
Average	2.6	2.0	1.25	1.0	2			2	3	2

Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz

(vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc

COURSE CONTENT

1. Water Supply Scheme &Sources and Conveyance of Water

General importance of water supply –Development of Water supply–Need for protected Water supply-Flow chart of a typical water supply scheme– Total quantity of water for a town, per capita demand and factors affecting demand - Water requirements for domestic purposes, industrial use, firefighting, commercial and institutional needs, public use –Variation in demand peak demand – seasonal, daily and hourly variation– Forecasting population by arithmetical, geometrical and incremental increase methods-problems on above methods.

Surface source Lakes, streams, rivers and impounded reservoirs – Underground sources-springs, wells, infiltration wells and galleries – Yield from wells by constant pumping and recuperation tests. (No problems required) - Comparison of surface and subsurface sources Types of intakes - Reservoir intake, River intake, Canal intake, Lake Intake - Conveyance of water-open channels, aqueduct pipes - Pipe Materials C.I Pipes, Steel Pipes, concrete pipes, A.C. Pipes, G.I. Pipes Plastic Pipes (PVC &HDPE), merits and demerits of each type - Pipe joints spigot and socket joint, flange joint, expansion joint for C.I. Pipe, joints for concrete and asbestos cement pipes - Pipe Laying and testing, Leak detection, prevention and rectification.

2. Quality and Purification of water.

Impurities of water need for laboratory test – sampling grab and composite sampling– Tests of water physical, chemical and bacteriological tests – P**H** value of water. – Standard quality for domestic use and industrial purposes - Flow diagram of different treatment units. –Aeration methods of aeration- Sedimentation plain sedimentation and sedimentation with coagulation - Filtration Construction and operation of slow sand, rapid sand and pressure filters - Disinfection of water necessity and methods of chlorination, prechlorination, break point chlorination - Colour, taste and odour control. Hardness – Types of Hardness Removal of hardness. NOTE: No design of treatment units.

3.Distribution system and water supply arrangements in a Building.

General requirements– systems of distribution - gravity system, combined system, direct pumping - Methods of supply Intermittent and continuous Storage – underground and overhead service reservoirs - necessity and accessories – Types of layout dead end, grid, radial and ring system their merits and demerits and their suitability– Location and functioning of: Sluice valves, Check valves or reflux valves, Air valves, Drain valves or blow off valves, Scour valves, Fire Hydrants, Water meters– Water supply arrangements in building – Definition of terms; water main, service pipe, communication pipe, supply pipe, distribution pipe, air gap - General layout of water supply arrangement for single and multi-storeyed buildings as per I.S Code of practice general principles and precautions in laying pipelines within the premises of a building - Connections from water main to building with sketch - Water supply fittings, their description and uses stopcock, ferrule, goose neck etc.

4.Introduction to Sanitary Engineering and Quantity of Sewage

Object of providing sewerage works - Definition of terms : sullage, sewage, sewer and sewerage – classification of sewage - System of sewage disposal water carriage systems –Types of sewerage systems and their suitability – separate, combined and partially separate systems –Quantity of discharge in sewers, dry weather flow, variability of flow Determination of storm water flow – run off coefficient, time of concentration, rational method and empirical formulae for runoff - Surface drainage requirements, shapes, laying and construction –

5.Laying of Sewers and Sewer Appurtenances

Different shapes of cross section for sewers – circular and noncircular – merits and demerits of each - Brief description and choice of types of sewers - stone ware, cast iron, cement concrete sewers and A.C Pipes - Laying of sewers setting out alignment of a sewer, excavation, checking the gradient , preparation of bedding, handling, lowering, laying and jointing, testing and back filling - Brief description, location, function and construction of Manholes, Drop manholes, Street inlets, Catch basins, Flushing tanks, Regulators, Inverted siphon - Necessity of pumping sewage location and component parts of a pumping station.

6.Characteristics of Sewage, treatment & disposal

Strength of sewage - sampling of sewage, characteristics of sewage physical, chemical and biological Analysis of sewage – significance of the following tests for (No details of tests) Solids, C.O.D, B.O.D, Ph Value, Chlorides Characteristics of Industrial waste water–principles of treatment– Reduction of volume and strength of wastewater, Equalization, Neutralization and proportioning Preliminary treatment Brief description and functions of following units Screens, Skimming tanks and Grit chambers - Primary treatment - Brief description and functions of Plain sedimentation - Secondary treatment Brief description of Trickling filters - Activated sludge process, Oxidation ditch, Oxidation pond, Aerated lagoons, Anaerobic lagoons Sludge digestion – Process and methods of sludge disposal - Miscellaneous treatments septic tank Sewage disposal dilution, disposal on to lands, ground water recharge, reuse etc.

7.Rural Water Supply and Sanitation

Disinfection of wells -Rural sanitation and sanitary latrines, biogas production technology brief description and operational details of biogas plants using animal waste, night soil and agricultural wastes KVIC and JANATA models merits and demerits – maintenance of biogas plant Vermi composting –procedure –advantages.

8.Air Pollution

Definition sources of air pollution – effects of air pollution – methods of Control of air pollution – Knows Air pollution control equipment.

REFERENCE BOOKS:

1.Water Supply & Sanitary Engineering – Including Environmental Engineering & Pollution Control Act's, G. S. Birdie, Dhanapati Rai publishing company
2.Elements of Environmental engineering, K.N. Duggal, S. Chand Publications
3.Textbook of Water Supply and Sanitary Engineering, S.K. Hussain, CBS Publishers and
distributors Pvt Ltd.
4.EnvironmentalEngineering,N.N.Basak, Tata Mc Graw-Hill education
5. Water Supply Engineering, Santosh Kumar Garg, Khanna Publishers

Table specifying the scope of syllabus to be covered for Unit Test-I & Unit Test-II

Unit Test	Learning Outcomes to be covered
Unit Test – I	From 1.1 to 3.10
Unit Test – II	From 4.1 to 8.4

QUANTITY SURVEYING

Course code	Course title	No. of period/week	Total no. of periods	Marks for Formative Assessment	Marks for Summative Assessment
C-503	Quantity Surveying	05	75	20	80

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. of Periods	Weightage of marks	No. of Short Answer Questions	No. of Essay Questions	COs Mapped
1	Introduction, Units and Specifications	5	6	2	-	CO1
2	Detailed Estimates of buildings	28	26	2	2	CO2
3	Analysis of Rates and Abstract Estimates	16	26	2	2	CO2
4	Earthwork Calculations	10	26	2	2	CO3
5	Detailed estimates of Roads, Culverts and Public Health Engineering Works	16	26	2	2	CO4
	TOTAL	75	110	10	8	

COURSE OBJECTIVES:

Upon completion of the Course, the student shall be able to		
Course Objectives	(i)	Familiarize with the fundamentals of quantity surveying, cost estimating & specifications
	(ii)	Prepare detailed estimates and abstract estimates for buildings, Detailed estimates of Roads, Culverts and Public Health Engineering Works
	(iii)	Calculate the volumes of earthwork and reservoir capacities

COURSE OUTCOMES:

Course Outcomes	CO1	C-503.1	Explain the basic concepts of Quantity Surveying, Units and Specifications
	CO2	C-503.2	Prepare Lead statement, Data Sheet, Detailed and Abstract estimates for the given Civil Engineering Structure
	CO3	C-503.3	Compute the volumes of earth work and reservoir capacity
	CO4	C-503.4	Prepare detailed estimates of quantities required for construction of Roads, Culverts and Public Health Engineering Works

LEARNING OUTCOMES:

Learning Outcomes	**1.0 Introduction, Units and Specifications** 1.1 Define: a) Quantity Surveying b) Estimate 1.2 State the need for quantity surveying 1.3 List different types of estimates 1.4 Explain the need for different estimates 1.5 Distinguish among element of structure, item of a work & materials of construction 1.6 List the duties of Quantity Surveyor 1.7 State the units of measurements, data and payment for different items of work and materials using IS: 1200 1.8 State two types of taking out measurement. 1.9 Explain Centre Line Method & Long and Short Wall Method 1.10 Explain the process of taking measurements for different works and tolerances 1.11 Define specifications 1.12 State the need for specifications 1.13 List different types of specifications 1.14 State the general specifications for important items of work

	1.15 Prepare approximate estimates for residential and non-residential buildings with given data of size/capacity and rates considering cost of building services and other over heads 1.16 Explain 'Detailed Estimate' and 'Abstract Estimate' 1.17 Differentiate between 'Detailed estimate' and 'Abstract estimate' 1.18 Write formats of detailed estimate and abstract estimate **2.0 'Detailed estimates' of buildings** 2.1 State the information required for preparation of detailed estimates of a building 2.2 Prepare the detailed estimates for various buildings from the given drawings, specifications and site conditions: a) Compound wall and Steps b) Single Room with Verandah (Load bearing structure) c) Single storied Residential building with one bed room (1 BHK) (Load bearing structure) 2.3 Prepare the estimation for various elements of a steel roof truss for an Industrial building 2.4 Prepare the estimation of a Septic tank with Soak pit. **3.0 Analysis of Rates and Abstract estimate** 3.1 Define analysis of rates 3.2 Explain the purpose of analysis of rates 3.3 Explain the following in rate analysis: a) Standard data book b) Standard schedule of rates c) Standard data sheet 3.4 Explain the following terms: a) Blasting charges b) Seigniorage charges c) Cess charges d) Stacking charges e) Water charges f) Crushing charges g) Lead charges h) Area allowances on labour component i) Loading and Unloading charges for material j) Overhead charges 3.5 Explain cost of material at source and site 3.6 Define lead statement, write the format for Lead Statement, Prepare Lead Statement for different materials 3.7 List different types of labour wages as per latest SSR 3.8 Prepare the data sheet for finished items of works using standard data and SSR 3.9 Tabulate the material requirement of mortars and concrete of different proportions 3.10 State different items involved in Abstract estimation of a

	building **4.0 Earth work calculations** 4.3 Explain terms: a) Embankment b) Cutting c) Volume of earth work 4.4 Define the terms: a) Lead b) Lift 4.5 State the standard values of 'Lead' and 'Lift' 4.6 Calculate the lead and lift for a given section 4.7 List different methods of computing the areas and volumes 4.8 Explain: a) Mean sectional area method b) Mid sectional area method c) Trapezoidal rule d) Prismoidal rule 4.9 State the limitations of Prismoidal rule 4.10 Compute the volumes of an embankment for a given data 4.11 Compute the volumes of a cutting for a given data 4.12 Prepare detailed estimates for earth work for roads, canals and earthen bunds 4.13 Compute gross and effective capacity of a reservoir from the areas of different elevations **3.0 Detailed estimates of roads, culverts and Public Health Engineering works** 3.1 Prepare a detailed estimate for different types of roads 3.2 Prepare a detailed estimate for (a) Pipe culvert (b) Slab culvert 5.3 Prepare a detailed estimate for the following items: a) Open well b) R.C.C. Square/Rectangular overhead tank c) Sanitary block 5.4 State the items to be included in the abstract estimates of above structures

PO-CO Mapping:

Course Code: C-503	**Course Title: QUANTITY SURVEYING-I** **No of COs : 4**				**No. of periods: 75**
POs	**Mapped with CO No**	**CO Periods Addressing PO in Col 1**		**Level (1,2,3)**	**Remarks**
		No	**%**		
PO1	CO1, CO2, CO3, CO4	20	27	2	>40% Level 3 (Highly Addressed) 25% to 40% Level 2 (Moderately
PO2	CO1, CO2, CO3, CO4	55	73	3	
PO3					
PO4					

PO5					Addressed) 5% to 25% Level 1 (Low Addressed) <5% (Not Addressed)
PO6					
PO7					

CO-PO Mapping:

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2						3	3	3
CO2	2	3						3	3	3
CO3	2	3						3	3	3
CO4	2	3						3	3	3
Average	2.25	2.75						3	3	3

Note: The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:
(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits ..etc.

COURSE CONTENT:

1. Introduction, Units and Specifications

Quantity surveying – Definition of estimate – Need for estimation – Types of estimates – Approximate estimate – Detailed estimate – Abstract estimate – Duties of Quantity Surveyor – Elements of a structure – Item of Work – Materials of construction – Line diagram for preparation of abstract estimate- Units of measurements for various items of civil engineering works as per IS: 1200 - Degree of accuracy in measurement – Deductions for openings in masonry, R.C.C. and Plastering – Painting coefficients - Different Methods of taking out quantities – Centre Line Method – Long and Short Wall Method - Specifications – Necessity – Types of specifications – General specifications of: Earth works, Brick/Stone Masonry with C.M, Reinforced Cement Concrete, Plastering with C.M, Floor finishes with ceramic tiles and marbles and White washing/Colour washing -Abstract Estimate - Definitions – Formats for detailed and abstract estimates - Preliminary or Approximate Estimate – Plinth area method – Cubic rate method – Service Unit method - Problems on Preliminary estimates (plinth area method only)

2. Detailed estimates of buildings

Compound wall and steps - Single Room with verandah - Single Storied Residential building with one bed room (1 BHK) - Single Storied Residential building with two bed rooms (2 BHK) - Estimation of a steel roof truss - Septic tank with soak pit

3. **Analysis of Rates and Abstract Estimates:**

Cost of materials at source and at site - Standard Schedule of Rates of different materials in buildings works - Types of labour – Wages as per S.S.R - Lead and Lift – Preparation of Lead Statement - Data Sheets – Standard data for materials and labour components for different items of work - Preparation of unit rates for finished items of works using Standard data and S.S.R. - Methods of calculating quantities of ingredients of various proportions of cement concrete.- Provisions for different building services and other overhead charges - Prepare abstract estimate for Single bedroom building (1 BHK), Two bedroom building with verandah (2 BHK).

4. Earth Work Calculations

Lead and Lift – Initial and subsequent values - Mid-Ordinate Method – Mean Sectional Area Method – Trapezoidal Rule – Prismoidal Rule for computing volumes in level sections for roads and Canals - Taking out quantities from Longitudinal Section and Cross Section in cutting and embankment of level sections - Capacity of Reservoir from the table of areas and contours

5. Detailed estimatesofroadsandculverts, and public health engineering works

GravelRoad–Waterboundmacadamroad–Surfacedressingwithbitumen–Cementconcrete road – Pipe culvert – R.C.C. slab culvert with i) straight returns–Differentitemsinabstractestimate (Labourcharges,Trafficdiversionetc.)

Open well with masonry staining – R.C.C. Rectangular/square overhead tank – Sanitary block – Different items to be included in the abstract estimates of theabove

REFERENCE BOOKS:

1. Estimating and Costing in Civil Engineering by B.N. Dutta -CBS Publishers and Distributors

Pvt Ltd

2. Estimating and Costing by S. C. Rangwala, Charotar Publishing House Pvt Ltd

3. Estimating Construction Costs by Robert L. Peurifoy & Garold D. Oberlender – McGraw-Hill Education

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TEST-I & II

Unit Test	Learning outcomes to be covered
Unit Test-I	From 1.1 to 3.3
Unit Test-II	From 3.4 to 5.4

ADVANCED CIVIL ENGINEERING TECHNOLOGIES

Course code	Course title	No. Of period/week	Total no. Of periods	Marks for Formative Assessment	Marks for Summative Assessment
C-504	Advanced Civil Engineering Technologies	04	60	20	80

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. of Periods	Weightage of marks	No. of Short Answer Questions	No. of Essay Questions	COs Mapped
1	IOT Applications in Civil Engineering	12	16	2	1	CO1
2	Prestressed concrete	12	26	2	2	CO2
3	Advanced methods in Earth retaining structures	10	26	2	2	CO3
4	Pre-fabricated Building Technology	10	23	1	2	CO4
5	Concepts of Green Buildings	10	13	1	1	CO5
6	Solar Energy Utilization in buildings	06	6	2	-	CO5
	Total	60	110	10	8	

COURSE OBJECTIVES:

Upon completion of the course, the student shall be able to	
COURSE OBJECTIVES	(i) Know the smart technologies, understand Prestressed Concrete, Advanced methods in Earth Retaining Structures
	(ii) Understands Prefabricated building technology, the concepts of Green Buildings and Solar utilisation in buildings

COURSE OUTCOMES:

Course Outcomes	CO1	Knows the IOT applications in CIVIL Engineering
	CO2	Learns about the Prestressed concrete
	CO3	Knows the Advanced methods in Earth retaining structures
	CO4	Understands Prefabricated building technology
	CO5	Explains the concept of Green buildings and Solar energy utilization in buildings

LEARNING OUTCOMES:

LEARNING OUTCOMES	1. **IOT Applications in Civil Engineering** 1.1 Understand the overview of Internet of Things (IoT) 1.1.1 Define the term IoT 1.1.2 State the working principle of IoT. 1.1.3 List the key features of IoT 1.1.4 List the components of IoT (hardware, software, technology and protocols) 1.1.5 List the advantages and disadvantages of IoT

	1.2 Understand the applications of IoT in various fields of Civil engineering 1.2.1 Mention the application of IoT in Smart Cities 1.2.2 State the application of IoT in Smart Energy and the Smart Grid 1.2.3 Mention the application of IoT in Smart Transportation and Mobility 1.2.4 State the application of IoT in Smart Home, Smart Buildings and Infrastructure 1.2.5 Mention the application of IoT in Smart Factory and Smart Manufacturing 1.2.6 Mention the application of IoT in Smart Health 1.2.7 Mention the application of IoT in Food and Water Tracking and Security 1.2.8 Mention the application of IoT in Social Networks Chain Surveying 2.0 **Prestressed concrete** 2.1 Understand fundamental principles of prestressed concrete, systems and types of Prestressing, merits and demerits 2.2 State the materials and permissible stresses 2.3 List the losses of prestress 2.4 Explain the methods of 1. Pre-stressing and 2. Pre-tensioning system 3.Posttensioning systems **3.0 Advanced methods in Earth retaining structures**

	3.1 Understand the concepts of advanced earth retaining structures 3.2 list the advantages of advanced earth retaining structures 3.3 List and explain the methods of advanced earth retaining structures – reinforced anchored earth wall – geogrids – geo mats **4.0 Pre-fabricated building technology** 4.1 State alternatives for cast in-situ structures 4.2 Understand pre fabrication technology 4.3 State Importance for standardisation and modularisation 4.4 State the pre-fabricated structures – explain their utility 4.5 State advantages of the pre-fabricated structures 4.6 State Materials used in pre-fabricated elements and explain their suitability for various climatic conditions 4.7 Explain types of pre-fabricated systems – large panel systems - frame systems – slab /column systems with walls – mixed systems **5.0 concepts of Green buildings** 5.1 State the terms and definitions: (a) Climate (b) weather (c) Global worming (d) Climate change (e) Sustainability (f) Carbon Foot Print (g) Carbon Credit h) Embodied energy i) Green building rating 5.2 Need of Green Buildings in present scenario 5.3 Objectives of Green Buildings 5.4 Importance of Green buildings 5.5 Benefits of Green buildings 5.6 Features of Green buildings 5.7 Merits and Demerits of Green buildings 5.8 Green Building Rating system

	5.9 Fundamental Principles of Green buildings 5.9.1 State the importance of Geographical Location of Buildings 5.9.2 Understand the concepts of Site Management with respect to Green Buildings 5.9.3 Explain the Materials/Alternate materials/Transport Foot Print 5.9.4 State the importance of Water conservation 5.9.5 Explain various alternative Construction Practices 5.9.6 Discuss the Post construction energy usage 5.9.7 Explain Waste management recycling and reuse 5.9.8 Know the importance of green cover in built environment **6.0 Solar energy utilization in buildings** 6.1 Explain the active and passive concepts in heating and cooling 6.2 List the various solar energy utilities like solar water heaters, solar air heaters, solar cookers, lighting and water pump sets and solar PV panels

CO Mapping with POs

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	2	-	3	2	-	3
CO2	1	1	-	2	2	-	3
CO3	3	2	1	2	1	-	-
CO4	3	1	2	2	1	-	-
CO5	3	2	1	2	1	-	-
Average	2.2	1.6	1.33	2.2	1.4	-	3

Course Code : C-504	Course Title: Advanced Civil Engineering Technologies Number of COs: 05				No. of Periods: 60
POs	Mapped with CO Nos	CO Periods addressing PO in Col. 1		Level (1,2,3)	Remarks
		No	%		
PO1	CO1, CO2, CO3, CO4, CO5	16	27	2	> 40% Level 3
PO2	CO1, CO2, CO3, CO4, CO5	10	16	1	Highly addressed
PO3	CO1, CO2, CO3, CO4, CO5	8	13	1	25% to 40% Level 2
PO4	CO1, CO2, CO3, CO4, CO5	16	27	2	Moderately
PO5	CO1, CO2, CO3, CO4, CO5	9	14	1	addressed
PO6					5 to 25% Level 1
PO7	CO1, CO2	1	3		Low addressed

COURSE CONTENT

1. IOT Applications in Civil Engineering

Overview of IoT - Define IoT, how IoT work, key features of IoT, components of I o T : Hardware, Software, Technology and Protocols, advantages and disadvantages of IoT - IoT Applications - Smart Cities, Smart Energy and the Smart Grid, Smart Transportation and Mobility, Smart Home, Smart Buildings and Infrastructure, Smart Factory and Smart Manufacturing, Smart Health, Food and Water Tracking and Security, Participatory Sensing, Social Networks

2. Prestressed Concrete

Introduction – Basic principles – Systems of prestressing – Types of prestressing

Advantages and Disadvantages - Requirements of steel and concrete for prestressed concrete- Losses of Prestress - Tensioning devices – Method of Prestressing – Pretensioning system – Post

tensioning systems – Freyssinet, Magnel - Blaton, Gifford Udal and LeeMcal

3.Advanced methods in Earth retaining structures

Concept of advanced earth retaining structures- Advantages of advanced earth retaining structures- Methods of advanced earth retaining structures –Reinforced anchored earth wall

Geogrids-geo mats

4. Pre-fabricated building technology

Alternatives for cast in-situ structures- pre fabrication technology- Importance for standardisation and modularisation - pre fabricated structures – explain their utility - advantages of the pre-fabricated structures - Materials used in pre fabricate elements and explain their suitability for various climatic conditions - types of pre-fabricated systems – large panel systems - frame systems – slab /column systems with walls – mixed systems

5. Concepts of Green Buildings:

Terms and definitions-Climate, weather, Global warming, Climate change, Sustainability, Carbon Foot Print, Carbon Credit, Embodied energy, Green building rating - Need of Green Buildings in present scenario - Objectives of Green Buildings - Importance of Green buildings - Benefits of Green buildings - Features of Green buildings - Merits and Demerits of Green buildings - Green Building Rating system - Fundamental Principles of Green buildings - State the importance of Geographical Location of Buildings - Understand the concepts of Site Management with respect to Green Buildings - Explain the Materials/Alternate materials/Transport Foot Print - State the importance of Water conservation - Explain various alternative Construction Practices - Discuss the Post construction energy usage - Explain Waste management recycling and reuse - Know the importance of green cover in built environment

6. Solar Energy Utilization in Building

Active - Passive concepts of solar Heating and cooling - Solar energy utilities – water heaters, air heaters, cookers, lighting and water pump Sets - Roof top Solar power generation systems

REFERENCE BOOKS:

1. N.Kishnam Raju, Prestressed Concrete, Mc Graw Hill, New Delhi
2. Braja M Das, Fundamentals of Geotechnical Engineering
3. CBRI Building Materials and Components, NPTEL Lecture 31
4. Prof shiva Kumar Babu, Reinforced Soil Retaining Walls, Designs and construction.
5. Dr. R. Sarvanan, Prefabricated Structures, Laxmi Publications
6. G. Hari Hara Iyer, Green Building, Kindle Edition
7. Dr. R.Suresh Kumar, Fundamentals of Solar Energy, Edu creation publications

TABLE SPECIFYING THE SCOPE OF SYLLABUS TO BE COVERED FOR UNIT TEST-I & II

Unit Test	Learning outcomes to be covered
Unit Test-I	From 1.1 to 3.3
Unit Test-II	From 4.1 to to 6.2

CONSTRUCTION MANAGEMENT AND ENTREPRENEURSHIP

Course code	Course title	No. Of period/week	Total no. Of periods	Marks for Formative Assessment	Marks for Summative Assessment
C-505	Construction Management and Entrepreneurship	03	45	20	80

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. of Periods	Weightage of marks	No. of Short Answer Questions	No. of Essay Questions	COs Mapped
1.	Introduction	3	3	1	-	CO1
2.	Organizational Aspects	6	13	1	1	CO1
3.	Management Tools	8	23	1	2	CO2
4.	Contracts and Tenders and Arbitration	10	26	2	2	CO3
5.	Management of Resources in Construction	8	26	2	2	CO4
6.	Entrepreneurship	6	6	2	-	CO5
7.	Human Relations and Professional Ethics	4	13	1	1	CO5
	Total	45	110	10	8	

COURSE OBJECTIVES:

Upon completion of the course the student shall be able to		
Course Objectives	(i)	Familiarize with the Preliminary Planning & Organizational aspects, constructional planning, contracts and tender systems.
	(ii)	Gain adequate knowledge in managing different resources in construction field and human relations and professional ethics.

COURSE OUTCOMES:

Course Outcomes	**CO 1**	C-505.1	State the importance of project management and Organizational aspects.
	CO 2	C-505.2	Analyse the tools of Management for construction projects in planning.
	CO 3	C-505.3	Discuss different types of contracts, Tendering systems and Arbitration.
	CO 4	C-505.4	Analyse the principles of management of Resources like Men, Material and Machinery.
	CO 5	C-505.5	Discuss the role of Entrepreneur for better outcome in construction industry by inculcating better Human Relations.

LEARNING OUTCOMES:

Learning Outcomes	**1.0**	**Introduction**
	1.1.	Define Management.
	1.2.	State the functions of Management.
	1.3.	State the need for scientific Management of projects.
	1.4.	Describe the fields level management.
	1.5.	Describe the sequencing of work
	2.0	**Organizational Aspects**
	2.1.	Explain the organizational structure of any Engineering department (Government).
	2.2.	List the duties of different officers of an Engineering department.
	2.3.	Define Preliminary estimate, Detailed estimate, Administrative approval and Technical sanction.
	2.4.	State the limit of powers of sanction by various officers in an Engineering Department (Government).
	2.5.	Give the Organizational structure of a public sector construction company.
	2.6.	Compare the Headquarters versus Regional and Project Management.
	2.7.	List the duties of Chief Engineer in a construction company.

	2.8. List the duties of a Resident Engineer. 2.9. **3.0 Management Tools** 3.1 Define CPM and PERT. 3.2 State the advantages of CPM and PERT. 3.3 Explain the use of bar chart and its limitations 3.4 Define Network, Activity, Event, Activity duration, Dummy activity, EST, EFT, LST, LFT, Total float, free float and Critical path. 3.5 Prepare Network diagram using basic rules of network formation. 3.6 Calculate Project duration using CPM network identifying critical activities, critical path, free float and total float. 3.7 State the limitations of CPM. 3.8 Distinguish between CPM and PERT. **4.0 Contract, Tendering systems and Arbitration** 4.1 Define contract, State the contents of a contract document, and Explain different contract systems available for construction works. 4.2 List the merits and limitations of each of the contract systems, List the general conditions of contract for a civil engineering construction project. 4.3 Define tender, Explain the need for calling of tenders, List the steps involved in fixing up agency through tender system. 4.4 Draft a tender notice for a work, Prepare tender documents. 4.5 Explain the need of earnest money and security deposits. 4.6 Prepare a comparative statement. 4.7 Explain the method of selecting a contractor from the tenders, List out the conditions of contract agreements. 4.8 Define the terms Dispute and Arbitration, Explain the scope for disputes in a construction industry. 4.9 State the need for arbitration, List the qualifications of an arbitrator, List the advantages of arbitration. **5.0 Management of Resources in construction** 5.1 Explain the scope of materials management, Classify the common building materials based on the procurement, Explain different Stages of materials management. 5.2 Explain the points to be observed in the storage of perishable and non-perishable store materials, Explain the terms Indent, Invoice and Bin card, Explain the importance of verification of stores. 5.3 Explain the need for mechanization, Explain the need for optimum utilization of plant and equipment, Explain the financial impact of mechanization. 5.4 Explain about the preventive maintenance of plant and equipment. 5.5 Explain the importance of training of operators.

	5.6 Explain the need for overhauling or replacement. 5.7 Explain the requirements of centering, shuttering and scaffolding 5.8 State the importance of finance as a resource. 5.9 Explain the different stages at which cost control can be achieved. 5.10 Explain the financial control at head office level and site level. **6.0 Entrepreneurship** 6.1 Define 1. Entrepreneur and 2. Entrepreneurship. 6.2 Outline the concepts of entrepreneurship. 6.3 State the role of entrepreneur in economic development. 6.4 List the characteristics of an entrepreneur. 6.5 Evaluate the risks and rewards of an entrepreneur. 6.6 State the role of financial institutions in entrepreneurial development. **7.0 Human relations and professional ethics** 7.1 State role of Human relations and Performance in organization. 7.2 State the role of Interpersonal relationship for effective work culture.

CO-PO Mapping:

Course Code : C-505	**Course Title: Construction Management and Entrepreneurship** **Number of Cos: 05**				**No. Of Periods: 45**
PO #	**Mapped with CO #**	**CO Periods addressing PO in Column 1**		**Level (1,2,3)**	**Remarks**
		No	**%**		
PO1	CO1, CO2, CO3, CO4, CO5	18	40	3	**> 40% Level 3 Highly addressed** **25% to 40% Level 2 Moderately addressed** **5 to 25% Level 1**
PO2	CO2	3	7	1	
PO3	CO2	3	7	1	
PO4	CO2	3	7	1	

PO5	CO1, CO2, CO3, CO4, CO5	12	26	2	**Low addressed**
PO6	CO1, CO2, CO3, CO4, CO5	6	13	1	
PO7					

PO-CO Mapping:

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3				2	2		2	2	3
CO2	2	3	2	1	2	3		2	2	3
CO3	2				2	3		2	2	3
CO4	2				1	2		2	2	3
CO5	2				2	2		2	2	3
Average	2.2	0.6	0.4	0.2	1.8	2.4		2	2	3

Note: The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz

(vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc

COURSE CONTENT:

1. Introduction

Definition and concept of management – need for scientific management of projects – need for attitudinal change – Scope and characteristics of construction Industry.

2. Organizational Aspects

Govt. Organizations: Organizational structure of P.W.D. – duties of various officers – Preliminary estimates – detailed estimate – budget provision – administrative approval and technical sanction – powers of sanction-Public sector organizations: Organizational structure of a construction company – Head quarters versus Regional and Project Management–Duties of Chief Engineer – preparation of bids – duties of Resident Engineer.

3. Management Tools

Different Management Tools – Gantt Bar chart, modified Gantt bar chart – Limitations of bar charts – Introduction CPM and PERT – advantages of CPM and PERT – terms used in CPM – formation of network – Basic rules – Problems on determination of critical path – limitations of CPM – comparison of CPM and PERT.

4. Contracts, Tenders and Arbitration

Contracts – Legality of contracts – contract document – types of contracts – piece work contracts – item rate contracts – Lump sum contracts – percentage contracts – negotiated rates – departmental execution of works – merits and limitations of each contract system – conditions of contract for civil engineering works-Tenders – Necessity of tenders – Sealed tenders – tender notice – tender documents – Earnest Money and Security Deposits – Opening of tenders – comparative statement – acceptance of tenders – work order – contract agreement – conditions of contract-Arbitration – Disputes – disputes in construction industry – arbitration – need for arbitration – arbitrator – qualifications of arbitrator – advantages of arbitration.

5. **Management of Resources in Construction Industry**

Materials management – Scope – Classification of common building materials based on the procurement – procedural formalities for acquisition – stages of materials management-

Plant and Equipment – Need for mechanization – Optimum utilization of plant and equipment – Financial impact of mechanization – Preventive maintenance – Overhauling and replacement – Cantering, shuttering and scaffolding requirements-Financial Management – Finance as Resource – Purpose of cost control – stages of cost control – pre contract stage and post contract stage – Financial control at head office level and site level.

6. Entrepreneurship

Entrepreneur – concept, definition, role, expectation – characteristics of entrepreneur – risk and rewards of an entrepreneur – role of financial institution in entrepreneurial development.

7. Human Relations and Professional Ethics

Human relations and performance in organization – Understand self and others for effective behaviour – Interpersonal relationship for effective work culture – Need for professional ethics.

REFERENCE BOOKS

1. Management in construction Industry ,P.Dharwadker,Oxford& IBH Publishing Co. Pvt., Ltd.
2. Construction Management And Accounts , V.N.Vazirani& S.P. Chandola, Khanna Publishers.
3. Construction Planning and Management ,U.K. Shrivastava,Galgotia Publications Pvt. Ltd., New Delhi.

4. Construction Management and Planning ,B. Sengupta & H. Guna , Tata Mc. Graw Hill Publishing Company Ltd
.
5. Construction Management and Accounts ,Harpal Singh,Tata Mc. Graw Hill Publishing Company Ltd.

Table specifying the scope of syllabus to be covered for Unit Test-I & Unit Test-II

Unit Test	Learning Outcomes to be covered
Unit Test – I	From 1.1 to 4.4
Unit Test – II	From 4.5 to 7.2

STRUCTURAL ENGINEERING DRAWING

Course code	Course title	No. Of period/week	Total no. Of periods	Marks for Formative Assessment	Marks for Summative Assessment
C-506	Structural Engineering Drawing	04	60	40	60

TIME SCHEDULE

S.No.	Chapter/Unit Title	No. of Periods	Weightage of marks	No. of Short Answer Questions	No. of Essay Questions	COs Mapped
1.	Structural Planning and marking of Frame components	8	8	2	-	CO1
2.	R.C.C. Drawings	44	44	1	2	CO2
3.	Reading and interpretation of Structural Drawings	8	8	2	-	CO3
Total		60	60	5	2	

Note: In question paper, Part –A consists of FIVE questions of 4 marks each and Part –B consists of two questions of 20 Marks, both of them are from Chapter-2

COURSE OBJECTIVES:

Upon completion of the course the student shall be able to		
Course Objectives	(i)	Prepare the working drawings for steel reinforcement in different RCC members and able to read and understand the given drawings.
	(ii)	Calculate Steel quantity required from the given drawings.
	(iii)	Gain knowledge on how to draw and read the different structural steel members.

COURSE OUTCOMES:

Course Outcomes	CO1	C506.1	Draw the individual RCC members and the placement of reinforcement in it.
	CO2	C506.2	Draw the working drawings and evaluate the bar bending schedule for the given drawings.
	CO3	C506.3	Read and understand the working drawings.

LEARNING OUTCOMES*:*

Learning Outcomes	**1.0 structural planning and marking of Frame components** 1.1 Understand Positioning and Orientation of columns 1.2 Understand Positioning of beams 1.3 Understand Spanning of slabs 1.4 Explain layout of stairs 1.5 List types of footings 1.6 Prepare member reference scheme of Column reference scheme and Grid reference scheme (Scheme recommended by IS:5525 – recommended for detailing of reinforced concrete works and SP-34) **2.0 Draw the detailed working drawings of R.C.C.** 2.1 Draw the longitudinal section and cross sections of singly reinforced simply supported beam, Prepare schedule of reinforcement and quantity of steel for singly reinforced simply supported beam 2.2 Draw the longitudinal and cross section of lintel cum sunshade, Prepare schedule of reinforcement and quantity of steel for lintel cum sunshade 2.3 Draw the plan and longitudinal section of one-way slab showing reinforcement details, Prepare schedule of reinforcement and quantity of steel for one-way slab showing reinforcement details 2.4 Draw the details of reinforcement of two-way simply supported slab with corners not held down condition, Draw top and bottom plan and section along short and long spans of two-way simply supported slab with corners not held down condition, Prepare schedule of reinforcement of two-way simply supported slab with corners not held down condition 2.5 Draw the details of reinforcement of two-way simply supported slab with corners held down conditions, Draw top and bottom plan and section along short and long spans have to be drawn. (Scheduling of reinforcement is not necessary). 2.6 Draw the details of reinforcement of one-way continuous slab along with T- beam with details of slab and T-beam (plan and section of continuous slab and longitudinal section of T-beam have to be drawn). (Scheduling of steel is not necessary) 2.7 Draw the details of column and square footing (plan and sectional

	elevation) prepare schedule of reinforcement of column and footing and quantity of steel required. 2.8 Draw the reinforcement details of dog legged stair case (section only) prepare schedule of reinforcement for one flight including landing. **3.0 Read and interpret the drawings** 3.1 Understand the details of reinforcement from the given drawings 3.2 Fill in the details of reinforcement in a drawing.

PO-CO Mapping:

Course Code: C-506	**Course Title: Structural Engineering Drawing No.of Cos : 3**				**No. Of periods: 60**
Pos	**Mapped with CO No**	**CO Periods Addressing PO in Col 1**		**Level (1,2,3)**	**Remarks**
		No	**%**		>40% Level 3 (Highly Addressed) 25% to 40% Level 2 (Moderately Addressed) 5% to 25% Level 1 (Low Addressed) <5% Not Addressed
PO1	CO1,CO2,CO3	12	20	1	
PO2	CO1,CO2,CO3	30	50	3	
PO3	CO1,CO2,CO3	18	30	2	
PO4					
PO5					
PO6					
PO7					

CO-PO Mapping:

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2					1	2	2
CO2	2	3	2					1	2	2
CO3	2	3	3					1	2	2
Average	2.3	2.7	2.3					1	2	2

Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz

(vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc

COURSE CONTENT

1.0 Structural planning and marking of Frame components

Draw the position of columns, beams, slabs, stairs and footing in a given line diagram of building – Prepare member reference scheme of Column reference scheme as per IS:696 code of practice for general engineering drawing and Grid reference scheme as per IS:5525 – recommended for detailing of reinforced concrete works and SP-34

2.0 R.C.C Drawings

Draw the longitudinal section and cross sections and Prepare schedule of reinforcement and quantity of steel for – Singly reinforced simply supported rectangular beam – Lintel cum sunshade –Simply supported one-way slab – Two-way slab simply supported corners not held down – Two-way slab simply supported corners held down – One-way continuous slab and T-beam (with details of slab and T-beam) – Column with square footing of uniform thickness.- Stair case – stairs spanning longitudinally (Dog legged stair case)

3.0 Reading and interpretation of Structural Drawings

Understand the details of reinforcement from the given drawings - Fill in the details of reinforcement in a drawing.

REFERENCE BOOKS

1. Designing and detailing hand book SP-34

FIELD PRACTICES

Course code	Course title	No. Of period/week	Total no. Of periods	Marks for Formative Assessment	Marks for Summative Assessment
C-507	Field Practices	04	60	40	60

S.No.	Chapter/Unit title Name	No. Of periods/week	CO's Mapped
1.	Marking for the earth work of a pillar &for the junction of two walls	07	CO1
2.	Marking for the earth work of a simple two roomed building	07	CO2
3.	Marking for the centre line of a one room in a residential building with reference to the given point using Total Station	07	CO2
4.	Preparation of cement mortar with specified mix proportion by manual mixing and volumetric proportioning.	07	CO3
5.	Construction of 230mm thick brick wall in English Bond at the corner of a Wall and check for horizontality and verticality.	10	CO3
6.	Supervisory skills of Plastering of a wall.	10	CO4
7.	Supervisory skills for construction of Cement Concrete Flooring and of fixing of floor trap, gully trap and their connections to drain.	10	CO4
8.	Placement of reinforcement in an Isolated Column Footing with proper	10	CO5

	cover & Positioning of shuttering to the column reinforcement		
9.	Placement of reinforcement for sun shade (with specific attention of location).	10	CO5
10.	Placement of reinforcement for stairs spanning longitudinal case (with specific attention at the junction of waist and landing slabs).	10	CO5
11.	Placement of reinforcement for slab (with specific attention of chairs). OR Placement of reinforcement for a Beam column junction (with specific attention to Earth quake resistance design).	10	CO5
	Total Periods	105	

COURSE OBJECTIVES*:*

Upon completion of the syllabus, the student shall be able to		
COURSE OBJECTIVES	(i)	Learn the marking for earthwork, footings, basement and walls/columns of simple buildings.
	(ii)	Familiarise with the process of plastering, concreting and fixing of traps
	(iii)	Gain knowledge on the placement of reinforcement for different components of a building.

COURSE OUTCOMES:

COURSE OUTCOMES	CO 1	C-507.1	Mark for earthwork of pillars, junction of two walls, simple buildings.
	CO 2	C-507.2	Mark centre line for simple buildings.
	CO 3	C-507.3	Prepare cement mortar mix by volumetric batching, arrange bricks in different bonds to plumb.
	CO 4	C-507.4	Supervise plastering of walls, C.C. Flooring and fixing of traps.
	CO 5	C-507.5	Position shuttering and reinforcement in various components of building.

LEARNING OUTCOMES:

LEARNING OUTCOMES	**1.0 Marking for the earth work of a pillar & for the earth work of a junction of two walls** 1.1 Note down the measurements of pillar at superstructure and measurements of earth work excavation. 1.2 Mark the centre lines of pillar in either direction. 1.3 Mark the size of pillar with reference to the centre lines. 1.4 Mark the size by pouring the lime. 1.5 Read the width of walls at super structure from drawing. 1.6 Mark the centre line of main walls from the markings on marking pedestals. 1.7 Mark the centre line of cross wall perpendicular to main wall with the help of wooden set square or by other means. 1.8 Transfer the same by pouring the lime on the centre line. **2.0 Marking for the earth work of a simple two roomed building** 2.1 Prepare the centre line diagram from a given drawing. 2.2 Note down width of earthwork excavation. 2.3 Mark the centre lines on the ground with the help of plumb bob. 2.4 Check the accuracy by measuring length of two diagonals and their equality. 2.5 Mark the width of excavation with the help of threads placed parallel to the centre line and at a distance equal to half the width of excavation on either side of centre line. 2.6 Transfer the same by pouring lime to proceed for excavation. **3.0 Marking for the centre line of a one room in a residential building with reference to the given point using Total Station** 3.1 Place the total station at the point of known co-ordinates. 3.2 Perform temporary adjustments. 3.3 Key in the known co-ordinates of the point. 3.4 Place the target prism on the ground to locate the first corner point of known/calculated co-ordinate of centre line of the room. 3.5 Transfer the first corner point on to the ground. 3.6 Repeat the procedure to locate the second, third, fourth corner points of known co-ordinates and transfer the points on to the ground. **4.0 Preparation of cement mortar with specified mix proportion by manual mixing and volumetric proportioning** 4.1 Note the mix proportion and take the respective quantities of cement and sand (volume of 1bag of cement = 0.035 cubic meter).

	4.2 Place the measured quantity of sand to a suitable stack on an impervious hard surface. 4.3 Spread the cement uniformly over the sand stack. 4.4 Dry mix both sand and cement thoroughly to a uniform colour. 4.5 Sprinkle sufficient quantity of water on the dry mix while thoroughly mixing the dry mortar, which can be used for 30 minutes. 4.6 Continue the mixing to bring the mortar to a stiff paste of working consistency. **5.0 Construction of 230mm thick brick wall in English Bond at the corner of a wall and check for horizontality and verticality** 5.1 Soak the bricks in water and air dry before their use. 5.2 Prepare C.M of specified proportion and keep ready for use 5.3 Sketch the two threads perpendicular to each other at specified corner in line with the outer edges of wall. 5.4 Arrange the quoin header in line with the two perpendicular threads 5.5 Arrange the queen closure adjacent to quoin header. 5.6 Continue one layer with headers on one face and stretchers on the perpendicular face to the true line. 5.7 Continue the next layer with stretchers on headers and headers on stretchers. 5.8 Check the verticality of the wall with the help of plumb bob and horizontality with the help of level tube for every three to four layers. 5.9 Place the bricks, with frog at the top. 5.10 Fill the vertical joint in each layer with mortar using trowel. **6.0 Supervisory skills of Plastering of a wall** 6.1 Prepare the surface by raking the joints and brushing the effloresence if any by brushing and scraping dust and loose mortar. 6.2 Remove efflorescence if any by brushing and scraping. 6.3 Wash the surface thoroughly with water and keep the surface wet before commencement of plastering. 6.4 Complete the ceiling plaster before commencement of wall plaster 6.5 Fill all put log holes in advance of the plastering. 6.6 Start plastering from top and work down towards the floor. 6.7 Apply 15cm x 15cm plaster of specified thickness first, horizontally and vertically at not more than 2.0m intervals over the entire surface to serve as gauges. 6.8 Check the surfaces of gauges for truly in plane of the finished plaster surface by using a plumb bob. 6.9 Apply the mortar on the wall between the gauges with a trowel to a thickness slightly more than the specific

	thickness. 6.10 Use a wooden straight edge to bring to the true surface with small upward and sideways movement at a time reaching across the gauges. 6.11 Use trowel to obtain final finish surface as a smooth OR wooden float for sandy granular texture. 6.12 Avoid excessive use of trowel or over working the float. **7.0 Supervisory skills for construction of Cement Concrete Flooring and for fixing of floor trap, gully trap and their connections to drain.** **a. Base Concrete** 7.1 Use cement concrete of specified mix 7.2 Provide base concrete with the slopes towards floor trap required for the flooring using tube level. 7.3 Provide a slope ranging from 1:48 to 1:60 for flooring in varandah, courtyard, kitchen and bath. 7.4 Provide a slope of 1:30 for floors in water closet portion. 7.5 Provide necessary drop of 6mm to 10mm in flooring in bath, water closet and kitchen near floor traps to avoid spread of water. **b. Finishing** 7.6 Follow the finishing of the surface immediately after the cessation of beating. 7.7 Allow the surface till moisture disappears from it. 7.8 Use of dry cement or cement mortar to absorb excessive moisture not permitted. 7.9 Spread the thick slurry of fresh cement and water @ 2kg of cement over an area of 1 square metre of flooring, while flooring concrete is still green. 7.10 The cement slurry shall be properly processed and finished smooth. 7.11 Finish the edge of sunk floor rounded with C.M 1:2 and finish with a floating coat of neat cement. 7.12 Cure the surface for a minimum period of 10 days. 7.13 Lay the flooring in lavatories and bath rooms only after fixing of water closets and squatting pans and floor traps. 7.14 Plug the traps while laying and open after curing and cleaning. **c. Fixing of traps and their connections to drain.** 7.15 Identify the Floor trap and Gully trap 7.16 Identify the location of fixing the floor trap and gully trap 7.17 Connect the floor trap to the drain pipe. 7.18 Fix the joint using proper filler and adhesive material such

		that the joint is water tight. 7.19 Fix gully trap on cement concrete foundation 65 mm x 65 mm and not less than 10 mm thick. 7.20 Prepare a mix of concrete 1:5:10 and jointing of gully outlet to the branch drain is done 7.21 Tarred gasket soaked in thick cement slurry shall first be placed round the spigot of the drain 7.22 The remainder of the socket is filled with stiff mixture of cement mortar in the proportion of 1:1. **8.0 Placement of reinforcement for an Isolated Column Footing and positioning of shuttering to the column reinforcement.** 8.1 The grill of column footing should be kept ready as per design data. 8.2 Mark the centre lines in both directions on levelling course / bedding concrete with the help of plumb bob from the string stretched over the marking pedestals. 8.3 Mark centre of the outer reinforcing rods of footing in either direction. 8.4 Carefully place the grill such that centre line markings of outermost reinforcing rods are exactly above the centre lines marked on the bedding concrete. 8.5 Place the chairs/cover blocks of specified thickness below the bottom layer of reinforcing rods. 8.6 Exercise care for rectangular column footing while placing reinforcing mat such that bars in longer direction are at bottom. 8.7 Place the column reinforcement with chairs or cover blocks over the foundation mat. 8.8 Prepare the reinforcement as per the drawing. 8.9 Check for the verticality of column reinforcement with plumb bob 8.10 Provide lateral support for the column reinforcement to keep them in position. 8.11 Prepare the shuttering and apply waste oil inside surface of the shuttering box and fastenings 8.12 Place the shuttering box around the column and fix the fastenings. 8.13 Check for the verticality of shuttering with plumb bob **9.0 Placement of reinforcement for sun shade (with specific attention of location)** 9.1 Prepare the reinforcement as per design 9.2 Prepare the centering for sun shade 9.3 Place the grill for sun shade such that the main

	reinforcement is in the top zone leaving the cover 9.4 Place the cement mortar cover blocks or chairs of specified height below the main reinforcement to have prescribed cover above the reinforcement 9.5 Observe for sufficient length of anchorage of main reinforcement into the lintel or the beam etc. **10.0 Placement of reinforcement for stairs spanning longitudinal case (with specific attention at the junction of waist and landing slabs)** 10.1 Read the reinforcement details from the bar bending schedule 10.2 Prepare the shuttering for the stairs as per the design. 10.3 Bend the reinforcing bars to the shape and length confirming to the bar bending schedule. 10.4 Place the bars at the specified spacing maintaining the cover with the help of chairs or cover blocks. 10.5 Exercise care in the placement of reinforcement at the junction of waist and loading slab. 10.6 Tie the distributors parallel to raisers at the specified spacing **11.0 Placement of reinforcement for slab (with specific attention of chairs) and placement of reinforcement for a beam column junction (with specific attention to Earth Quake resistance design)** 11.1 Prepare the reinforcement as per design 11.2 Rest the reinforcement in slabs on bar chairs 11.3 Securely fix the bar to chairs so that it won't move when concrete is placed around it. 11.4 Locate reinforcing bars and mesh so that there is enough room between the bars to place and compact the concrete. 11.5 Anchor the reinforcement to improve the transfer of tensile forces to the steel by bending or hooking or lapping the bars. 11.6 Read the reinforcement details from the bar bending schedule 11.7 Note down proper cover-clear cover, nominal cover or effective cover to reinforcement. 11.8 Decide detailed location of opening/hole and supply adequate details for reinforcements around the openings.. 11.9 Show enlarged details at corners, intersection of beams and column junction 11.10 Avoid congestion of bars at points where members intersect and make certain that all reinforcement is properly placed. 11.11 In the case of bundled bars, Make lapped splice of bundled bars by splicing one bar at a time 11.12 Stagger such individual splices within the bundle. Make sure that hooked and bent up bars can be placed and have adequate concrete protection.

PO-CO MAPPING STRENGTH:

Course Code : C-507	Course Title: Field Practices Number of Cos: 05				No. Of Periods: 60
Pos	Mapped with CO Nos.	CO periods addressing PO in Col.1		Level (1,2,3)	Remarks
		No.	%		
1	CO1,CO2.CO3,C04,C05	10	14	1	>40% Level.3 (Highly addressed) 25% - 40% Level.2 (Moderately addressed 5% - 25% Level.1 (Low addressed) <5% Not addressed
2	CO1,CO2.CO3,C04,C05	18	30	2	
3	CO1,CO2.CO3,C04,C05	18	30	2	
4	CO1,CO2.CO3,C04,C05	10	20	1	
5					
6					
7	CO1,CO2.CO3,C04,C05	4	6	1	

CO-PO MAPPING:

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	3	2	2	3			2	2	3
CO2	2	3	2	3	3			2	2	3
CO3	3	2	3	3	2			2	2	3
CO4	2	2	2	2	2			2	2	3
CO5	2	2	2	2	2			2	2	3
Average	2.2	2.4	2.2	2.4	2.4			2	2	3

Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions (vi) Quiz

(vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc

Key competencies to be achieved by the student

S.No	Experiment title	Key competency
1	Marking for the earth work of a pillar. Marking for the earth work for the junction of two walls	Mark the size of pillar with reference to the centre lines. Mark the centre line of main walls from the markings on marking pedastals
2	Marking the centre line of a one roomed building	Mark the centre line of cross wall perpendicular to main wall
3	Marking for the earth work of a simple two roomed building	Check the accuracy by measuring length of two diagonals and their equality.
4	Marking for the centre line of a one room in a residential building with reference to the given point using Total Station	Transfer the first corner point on to the ground.
5	Preparation of cement mortar with specified mix proportion by manual mixing and volumetric proportioning.	Dry mix both sand and cement thoroughly a uniform colour
6	Construction of 230mm thick brick wall in English Bond at the corner of a Wall and check for horizontality and verticality.	Arrange the quoin header in line with the two perpendicular threads
7	Supervisory skills of Plastering of a wall.	Complete the ceiling plaster before commencement of wall plaster
8	Supervisory skills for construction of Cement Concrete Flooring. Supervisory skills of fixing of floor trap, gully trap and their connections to drain.	The cement slurry shall be properly processed and finished smooth. Fix the joint using proper filler and adhesive material such that the joint is water tight.
9	Placement of reinforcement in an Isolated Column Footing with proper cover. Positioning of shuttering to the column reinforcement	Mark centre of the outer reinforcing rods of footing in either direction. Place the shuttering box around the column and fix the fastenings
10	Placement of reinforcement for sun shade (with specific attention of location)	Place the grill for sun shade such that the main reinforcement is in the top zone leaving the cover
11	Placement of reinforcement for stairs spanning longitudinal case (with specific attention at the junction of waist and landing slabs).	Exercise care in the placement of reinforcement of at the junction of waist and loading slab.
12	Placement of reinforcement for slab (with specific attention of chairs). Placement of reinforcement for a Beam column junction (with specific attention to Earth quake resistance design).	Locate reinforcing bars and mesh so that there is enough room between the bars to place and compact the concrete. Decide detailed location of opening/hole and supply adequate details for reinforcements around the openings..

COURSE CONTENT

1. Marking for the earth work of a pillar. Marking for the earth work for the junction of two walls.
2. Marking the centre line of a one roomed building
3. Marking for the earth work of a simple two roomed building.
4. Marking for the centre line of a one room in a residential building with reference to the given point using Total Station.
5. Preparation of cement mortar with specified mix proportion by manual mixing and volumetric proportioning.
6. Construction of 230mm thick brick wall in English Bond at the corner of a Wall and check for horizontality and verticality.
7. Supervisory skills of Plastering of a wall.
8. Supervisory skills for construction of Cement Concrete Flooring. Supervisory skills of fixing of floor trap, gully trap and their connections to drain.
9. Placement of reinforcement in an Isolated Column Footing with proper cover. Positioning of shuttering to the column reinforcement.
10. Placement of reinforcement for sun shade (with specific attention of location).
11. Placement of reinforcement for stairs spanning longitudinal case (with specific attention at the junction of waist and landing slabs).
12. Placement of reinforcement for slab (with specific attention of chairs). Placement of reinforcement for a Beam column junction (with specific attention to Earth quake resistance design).

REFERENCE:

1. CPWD SPECIFIATIONS , Govt of India Vol I&II, 2009
2. Practical Civil engineering hand book, Kale and Shaw
3. Building Construction, S.P.Bindra&S.P.Arora, Dhanpat Rai publications
4. National Building Code, BIS publication

LIFE SKILLS

Course Title : Life Skills	**Course code : C-508** **(Common to all Branches)**
Year/ Semester : V Semester	**Total periods : 45**
Type of Course : Lab Practice	**Max Marks : 100** **(Sessional 40 + External 60)**

Course Objectives:	understand the relevance of life skills in both personal and professional lives
	practise life skills complementarily in life-management to lead a happy and successful life

	Course Outcomes:
CO1	exhibit right attitude and be adaptable in adverse and diverse situations
CO2	set appropriate goals and achieve them through proper planning, time management and self-motivation
CO3	solve diverse real-life and professional problems with critical thinking and creativity for a stress-free life
CO4	be an ideal team player and manifest as a leader

Course Delivery:

Text book: **"Life Skills" –** by State Board of Technical Education and Training, AP

Sl no	**Unit**	**Teaching Hours**
1	**Attitude**	**4**
2	**Adaptability**	**4**
3	**Goal Setting**	**4**
4	**Motivation**	**4**
5	**Time Management**	**4**
6	**Critical Thinking**	**4**
7	**Creativity**	**4**
8	**Problem Solving**	**5**
9	**Team work**	**4**
10	**Leadership**	**4**
11	**Stress Management**	**4**
	Total	**45**

Course Content:

UNIT I:Attitude ***matters!***
Preparatory activity-Role play; Generating word bank; Types of attitude. Read the passage and answer the related questions, read the story and discuss issues raised; Express opinions on the given topic and fill the grid with relevant words.

UNIT 2: **Adaptability…** ***makes life easy!***
Pair work-Study the given pictures and understand adaptability -read the anecdote and discuss, read the story and answer the questions, role play

UNIT 3: Goal Setting… ***life without a goal is a rudderless boat!***
Short term goals and long term goals-SMART features, observe the pictures and answer questions- matching- read the passage and answer questions-filling the grid.

UNIT 4: Motivation… ***triggers success!***
Types of motivation-difference between motivation and inspiration- matching different personalities with traits - dialogue followed by questions - writing a paragraph based on the passage.

UNIT 5: Time Management ***... the need of the hour!***

Effective Time Management- Time quadrant - Group task on management of time- Time wasters-fill in the grid, read the story and answer the questions- prioritising tasks.

UNIT 6: Critical Thinking… ***Logic is the key!***

Preparatory activity-read the passage and answer the questions- differentiate between facts and assumptions- components of critical thinking- complete the sets of analogies- choose the odd one out- true or false statements- decide which of the conclusions are logical.

UNIT 7: Creativity…. The essential YOU!!

Definition- Pre-activity-read the anecdote and answer the questions- matching celebrities with their fields of specialisation- think of creative uses of objects- think creatively in the given situations.

UNIT 8: Problem Solving… ***there is always a way out!***

Preparatory activity-read the story and answer the questions- discuss the given problem and come out with three alternative solutions- group activity to select the best solution among available alternatives- discuss the problem and plan to analyse it.

UNIT 9: Team Work… ***Together we are better!***

Advantages of team work- Characteristics of a team player- Activity-Observe the pictures and classify them into two groups- team game - read the story and answer the questions- fill in the grid.

UNIT 10 : Leadership… the ***making of a leader!***

Characteristics of effective leadership- styles of leadership- Activity-read the dialogue and answer the questions- identify the people in the picture and describe them- discuss leadership qualities of the given leaders- filling the grid- read the quotes and write the name of the leader.

UNIT 11: Stress Management … ***live life to the full !!***

Types of stress- Strategies for Stress Management- Activity-read the passage and answer the questions, read the situation and write a paragraph about how to manage stress.

Mapping COs with POs

POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**
COs	**POs 1 to 5 are applications of Engineering Principles, can't directly be mapped with Life Skills**					**1,2,3,4**	**1,2,3,4**

Unit wise Mapping of COs- POs

CO	**Course Outcome**	**CO Unit Mapped**	**PO mapped**	**Cognitive levels as per Bloom's Taxonomy R/U/Ap/An/Ev/Cr (Remembering / Understanding/ Applying/Analysing/ Evaluating/ Creating)**
CO 1	To exhibit right attitude and be adaptable to adverse and diverse situations	All Units (1 to 11)	6,7	U/Ap/ An
CO2	To set appropriate goals and achieve them through proper planning, time management and self-motivation	Units 3,4,5	6,7	U/Ap/An
CO3	To solve diverse real-life and professional problems with critical thinking and creativity for a stress-free life	Units 6,7,8,11	6,7	U/Ap/An/ Ev/ Cr.
CO4	To be an ideal team player and manifest as a leader	Units 9,10	6,7	U/Ap/An/ Ev

COMPUTER APPLICATIONS IN CIVIL ENGINEERING

Course code	Course title	No. of period/ week	Total no. of periods	Marks for Formative Assessment	Marks for Summative Assessment
C-509	Computer Applications in Civil Engineering	04	60	40	60

S. No.	Major Topics	No. of Periods	Cos Mapped
1.	MS EXCEL APPLICATIONS IN BUILDING ESTIMATES	20	CO1
2.	ANALYSIS of RCC STRUCTURES USING SOFTWARE	20	CO2
3.	CONSTRUCTION PROJECT MANAGEMENT USING SOFTWARE	20	CO3

COURSEOBJECTIVES:

Upon completion of the Course, the student shall be able to	
Course Objectives	1. Prepare the estimates for quantities of building components using MS Excel.
	2. Analyze RCC structures using software.
	3. Understand Project Management in construction using software

COURSEOUTCOMES:

Course Outcomes	CO 1	C-509.1	Estimate the different quantities of building components using MS Excel.
	CO 2	C-509.2	Analysis of RCC Structures using software.
	CO 3	C-509.3	Understand the use of project management software's in construction industry

LEARNINGOUTCOMES:

Learning Outcomes	**1 MS Excel applications in Building Estimates** 1.1 Prepare the detailed estimates for various buildings from the given drawings, 1.2 specifications and site conditions and report using MS-word for: Compound wall and Steps 1.3 Single Room with Verandah (Load bearing structure) 1.4 Single storied Residential building with one bed room (1 BHK)(Load bearing structure) 1.5 Single storied Residential building with two bed rooms (2 BHK)(Load bearing structure) 1.6 Two storied residential building (Framed structure) **2. ANALYSIS of RCC STRUCTURES USING SOFTWARE** 2.1 Carry out the analysis and design of simple RCC structures using any one of the available packages like STAADPRO, ETAB, CADS 3Doranyother suitable packages. **3. CONSTRUCTIONPROJECTMANAGEMENTUSINGSOFTWARE** **3.1** Develop the CPM / PERT Network for the proposed simple building project using any one of the available packages or any other suitable packages

PO-COMAPPING:

Course Code: C-509	**Course Title:** Computer Applications in Civil Engineering **NumberofCOs:03**				**No. of Periods:60**
POs	**Mapped with CO No.**	**CO Periods addressing PO in Column1**		**Level (1,2,3)**	**Remarks**
		No	**%**		
PO1	CO1,CO2,CO3	15	26	2	> 40% Level 3Highlyaddressed
PO2	CO1,CO2,CO3	6	11	1	
PO3	CO1,CO2,CO3	6	11	1	
PO4	CO1,CO2,CO3	25	40	3	25% to 40% Level 2Moderatelyaddressed
PO5	CO1,CO2,CO3	4	7	1	
PO6					
PO7	CO1,CO2,CO3	4	5	1	5 to 25% Level 1Low addressed

CO-POMAPPING:

CO No.	**PO1**	**PO2**	**PO 3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	2	3	3	2	3		2	2	2	3
CO2	2	3	2	3	3		2	2	2	3
CO3	3	2	2	3	2		2	2	2	3
Average	2.3	2.6	2.3	2.6	2.6		2	2	2	3

Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:

(i) Assignments(ii)Tutorials(iii)Seminars(iv)Guestlectures(v)Groupdiscussions(vi)Quiz
(vii)Industrialvisits(viii)Techfests(ix)Miniprojectworks(x)Libraryvisitsetc

COURSECONTENT

1. MS Excel applications in Building Estimates

Prepare the detailed estimates for various buildings from the given drawings, specifications and site conditions:

a) Compound wall and Steps
b) Single Room with Verandah (Load bearing structure)
c) Single storied Residential building with one bed room (1 BHK) (Load bearing structure)
d) Single storied Residential building with two bed rooms (2 BHK) (Load bearing structure)
e) Two storied residential building (Framed structure)
f) Reporting using MS-Word.

2. ANALYSIS of RCCSTRUCTURES USING SOFTWARE

a) Carry out the analysis and design of simple RCC structures using anyone of the packages like STAADPRO,ETAB,CADS 3Doranyother suitable packages.

3. CONSTRUCTION PROJECT MANAGEMENT USING SOFTWARE

a. Develop the CPM / PERT Network for the proposed simple building project using any one of the available packages mentioned below or any other suitable packages.

Commercial Software	Similar Opensource	Download Link
Microsoft Project	GANTT PROJECT	http://www.ganttproject.biz/

PROJECT WORK

Course code	Course title	No. Of period/week	Total no. Of periods	Marks for Formative Assessment	Marks for Summative Assessment
C-510	Project Work	03	45	40	60

Upon completion of the course the student shall be able to		
Course Objectives	(i)	Provide with the opportunity to synthesise knowledge from various areas of learning and critically and creatively apply it to real life situations.
	(ii)	Enable to acquire skills like collaboration, communication and independent learning to prepare them for lifelong learning and the challenges ahead.

Course Outcomes	CO1	Acquires collaborative skills through working in a team to achieve common goals.
	CO2	Reviews and evaluates the available literature on the chosen problem and formulates the methodology to solve the identified problem.
	CO3	Acquires the ability to make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.
	CO4	Acquires the skills to communicate effectively and to present ideas clearly and coherently to specific audience in both the written and oral forms.
	CO5	Learns on own, reflects on their learning and takes appropriate actions to improve it and prepares and presents project report

Learning Outcomes

Learning Outcomes	**PROJECT WORK** 1.1 Identifies different works to be carried out in the Project. 1.2 Collects data relevant to the project. 1.3 Carries out Site Surveys. 1.4 Selects the most efficient method from the available choices based on preliminary investigation. 1.5 Designs the required elements of the project as per standard practices. 1.6 Prepares working drawings for the project. 1.7 Estimates the cost of project, men, materials and equipment required. 1.8 Prepares schedule of time and sequence of operations. 1.9 Prepares project report. 1.10 Prepares C.P.M. Chart. 1.11 Collects the requirements to start a Small Enterprise/Industry under Self Employment Scheme. 1.12. Collects the necessary information to procure necessary finance, site and equipment. 1.13 Prepares the chart or model for each project.

Course Code: **C-510**	**Course Title:Project work**	No of COs : **5**			No. Of periods: **45**
POs	Mapped with CO	CO Periods Addressing PO in Col 1		Level (1,2,3)	Remarks
		No	%		>40% Level 3 (Highly Addressed)
PO1	CO1,CO2,CO3,CO4,CO5	15	33.3	2	25% to 40% Level 2 (Moderately Addressed)
PO2	CO1,CO2,CO3,CO4,CO5	15	33.3	2	5% to 25% Level 1 (Low Addressed)
PO3					<5% Not Addressed
PO4					
PO5					
PO6	CO1,CO2,CO3,CO4,CO5	15	33.3	2	
PO7					

CO Mapping with POs

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3				3	
CO2	3	3				3	
CO3	3	3				3	
CO4	3	3				3	
CO5	3	3				3	
Average	3	3				3	

COURSE CONTENT

Project work is intended to provide training in the solution of field engineering problems involving Surveying, Planning, drawing plans, designing, estimating and marking out of a building/highway/irrigation/public health project. Project work will also include the preparation of the feasibility report for any one type of enterprise under self – employment schemes.

Students shall be divided into groups of five each and shall be assigned a problem that calls for application of the knowledge he/she acquired in the course and also which involves some extra study of reference materials.

Problems

a) Planning of a Campus.

b) Building project.

c) Industrial complex

d) Irrigation project.

e) Rural Water Supply Scheme.

f) Sanitary Engineering Scheme.

g) Bridge project.

h) Low Cost Housing Scheme.

i) Design of framed structure type building by using a software package.

j) Set up of a small enterprise under self-employment scheme.

Every student should prepare a project report and submit the same for assessment. Every student puts his share to the work in all the operations of the project. The end examination in Project work shall consist of power point presentation and Viva-voce test to be assessed by a panel of examiners comprising of an External examiner, the Head of Section, and member of staff who guided the project as Internal examiner.

Scheme of Assessment (External)

1	Seminar	30 Marks
2	Internal assessment	20 Marks
3	Viva-Voce	10 Marks
Total		60 Marks

SIXTH SEMESTER

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTION AND MODEL BLUE PRINT FOR EVALUATION
CURRICULUM-2023

SIXTH SEMESTER

SI. No.	**Subject**	**Duration**	**Scheme of evaluation**		
			Item	**Nature**	**Max. Marks**
1	Industrial Training	6 months	1.First Assessment at Industry (After 12 Weeks)	Assessment of Learning outcomes by both the faculty and training Mentor of the industry	**120**
			2.Second Assessment at the Industry (After 22 weeks)	Assessment of Learning outcomes by both the faculty and training Mentor of the industry	**120**
			Final Summative assessment at institution l (After 24 weeks)	Training Report	**20**
				Demonstration of any one of the skills listed in learning outcomes	**30**
				Viva Voce	**10**
TOTAL MARKS					**300**

- The Industrial Training shall carry 300 marks and pass mark is 50% in assessment at industry (first and second assessment put together) and in final summative assessment at institution put together
- If the student fails to secure 50% marks in final summative assessment at institution level, the student shall reappear for final summative assessment, in the subsequent board examination.
- During Industrial Training the candidate shall put in a minimum of 90% attendance. If the student fails to secure 90% attendance during industrial training, the student should reappear for 6 months industrial training.

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTION AND MODEL BLUE PRINT FOR EVALUATION
CURRICULUM-2023

SIXTH SEMESTER

INDUSTRIALTRAINING

Course Code	Course Title	Duration	Marks for Formative Assessment	Marks for Summative Assessment
C-601	Industrial Training	24 weeks	240	60

Time schedule

S.No	Code	TOPICS	Duration
1	C-601	• Practical training in Industry • Training Report Preparation Report Preparation: Title Page, Certificate, Acknowledgements, Abstract, Contents(introduction of Industry/Organization, Organization structure, Duties of different officers in the organization, List of works undertaken by organization, Procedures adopted, M-book recording at various stages of construction, Procurement of Material, Labour & Equipment, Skills Acquired, Conclusions, Charts, Diagrams, Plans etc., pertaining to organization, Literature.	Six Months

COURSE OBJECTIVES:

Upon completion of the course the student shall be able to	
Course Objectives	1. Expose to real time working environment 2. Enhance knowledge and skills already learnt in the institution. 3. Acquire new skills of measuring, supervising and recording civil engineering works. 4. Develop qualities like team & work culture, integrity, responsibility and self confidence.

COURSE OUTCOMES:

COURSE OUT COMES	CO1	C601.1	Apply theory to practical work situations
	CO2	C601.2	Cultivate sense of responsibility and good work habits
	CO3	C601.3	Exhibit the strength, teamwork spirit and self-confidence
	CO4	C601.4	Write report in technical projects

PO-CO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2				2		1	3		2
CO2						3		3		2
CO3						3		3		2
CO4						3		3		2

3: High, 2: Moderate,1: Low

Note : The gaps in CO-PO mapping will be met by one or more appropriate activities from the following:

(i) Assignments (ii) Tutorials (iii) Seminars (iv) Guest lectures (v) Group discussions

(vi) Quiz (vii) Industrial visits (viii) Tech fests (ix) Mini project works (x) Library visits etc

LEARNING OUTCOMES:

The student shall be able to display the following skill sets

1) Planning & scheduling of works, material & man-power
2) Preparing the designs & drawings of structures and structural components with respect to loads, strengths etc.,.
3) Preparing& reading estimates for civil engineering works.
4) Drafting Skills (Like proposal for new works, repairs for existing works, justification for proposals, Inspection /investigation reports, request for man power /equipment / Budget)
5) Developing Inter-personal relationship skills such as working as a team for a common cause.(Communication – Verbal, Nonverbal ,written)
6) Supervising civil engineering works.(With respect to quality, progress rate, material & processes)
7) Identifying raw materials/tools/equipment appropriate for the nature of work and appreciate their importance, their source, mode of Transport to site etc.,(NOT For Final evaluation)
8) Recognizing and Practicing safety Measures in Construction Industry.
9) Preparing Reports pertaining to ongoing works.

Scheme of Formative Assessment and Summative Assessment for Industrial Training

Assessment no	Upon completion of	By	Based on	Max Marks
1	12 weeks	1.The faculty concerned and 2. Training Mentor of the industry	Skill sets as given in the scheme of assessment	120
2	20-22 weeks			120
3.Final summative Evaluation	23-24 weeks	1.The faculty member concerned, 2.HoD concerned and 3.An external examiner	1.Demonstration of any one of the skills listed in the Scheme of assessment	30
			2.Training Report	20
			3.Viva Voce	10
			TOTAL	300

Weightage of marks for Assessment of skills

During first and second assessment of INDUSTRAL Training

Skill set No	Skill set	Max Marks Allotted For each skill set
1	Planning & Scheduling of works, material & man power.	15
2	Reading Drawings & Preparing Designs of various structural components.	30
3	Given drawing, Preparing Estimates	25
4	Supervising Civil Engg works with respect to Quality, Progress rate, Material, Processes	20
5	Developing interpersonal relation (Spoken & written communication)	15
6	Drafting skills	15
	Total	**120**

Note : During assessment, the performance of the students shall be assessed in those skills in which the student has been trained and be awarded the marks as per the Weightage assigned as above. In case the student has undergone training in few skill sets only, then the total marks obtained shall be raised to 120 marks for the given assessment i.e. either assessment 1 or 2. However the performance of the student shall be assessed at the most skill sets listed above but not less than three skill sets.

Illustration: If the student has undergone training in only 4 skill sets (namely S.No. 1,2,4,5) and marks awarded during assessment is 50 out of 80 marks, then the marks of 50 shall be enhanced to 120 proportionately as (50x120/80=75)

GUIDELINES FOR INDUSTRIAL TRAINING OF DIPLOMA IN CIVIL ENGINEERING PROGRAMME:

1. Duration of the training: 6 months (24 Weeks).
2. Eligibility: As per SBTET norms
3. Training Area: Students may be trained in planning, Designing, Estimating, Drafting, Scheduling and executing of Civil Engineering works.
4. The candidate shall put a minimum of 90% attendance during Industrial training.
5. If the student fails to secure 90% attendance during industrial training, the student shall reappear for 6 months industrial training.
6. Formative assessment at industry shall be carried out by the Mentor from the industry, where the student is undergoing training and the in faculty in-charge (Guide) from the concerned section in the institution.
7. The Industrial training shall carry a Weightage of 300 marks and pass mark is 50% in assessments at industry (first and second assessment) and final summative assessment at institution put together i.e. 150 marks out of 300 marks.
8. If the student fails to secure 50% marks in final summative assessment at institution level, the student should reappear for final summative assessment in the subsequent board examination.
9. Final summative assessment at institution level is done by a committee including1. Head of the section (of concerned discipline ONLY), 2.External examiner from an industry and 3. Faculty member who assessed the student during Industrial Training as members

Roles and responsibilities of the faculty members who are assessing the students performance during industrial Training:

1. The faculty member shall guide the students in all aspects regarding training.
2. Shall create awareness regarding safety measures to be followed in the industry during the training period, and shall check it is followed scrupulously.
3. Shall check the logbook of the students during the time of their visit for the assessment.
4. Shall monitor progress at regular intervals and make appropriate suggestions for improvement
5. Shall visit the industry and make first and second assessments as per stipulated schedule.

6. Shall assess the skill sets acquired by the students during their assessment.
7. Shall award the marks for each skill set as per the marks allotted for that skill set during final assessment at institution.
8. Shall voluntarily supplement students learning through appropriate materials like photographs, articles, videos etc.
9. Shall act as co-examiner along with external examiner.
10. Shall act as liaison between the student and mentor.
11. Shall maintain a diary indicating his observation with respect to the progress of students learning in all three domains (Cognitive, Psychomotor and Affective)

Guidelines to the training mentor in the industry:

1) Shall train the students in all the skill sets as far as possible.
2) Shall assess and award the marks in both the assessments along with the faculty member.
3) Shall check and approve the log books of the students.
4) Shall approve the attendance of each student at the end of the training period.
5) Shall report to the guide about student's progress, personality development or any mis behaviour as the case may be.
6) Every Teacher (including HoD if not holding any FAC) shall be assigned a batch of students of 10 to 15 for industrial training irrespective of student's placements for training.

Department of Technical Education
Name of the institution
Industrial training assessment

PIN: **Name of the student:**

Skill Set Sl.No	*SKILL SET*	**Max Marks Allotted For each parameter**	**Precisely completes the task**	**Completes the task, mistakes are absent, but not Precise**	**Completes the task, Mistakes are a few**	**Makes attempt, Mistakes are many**
1	***Planning & Scheduling of works, material & man power (15)***	*5*	*5*	*3*	*2*	*1*
	(i)Planning of the work	*5*	*5*	*3*	*2*	*1*
	(ii) Scheduling of the work					
	(iii) preparing weekly/monthly Material and Manpower requirement, recording the actuals	*5*	*5*	*3*	*2*	*1*
2	***Reading Drawings & Preparing Designs of various structural components (30)***					

	(i) Reading Drawings, preparing working drawing *(ii) Preparing Designs for small elements*	*15* *15*	*15* *15*	*10* *10*	*9* *9*	*6* *6*
3	***Given drawing, Preparing Estimates(25)*** *(i) Preparing Data* *(ii) Preparing Detailed cum Abstract Estimates*	 *10* *15*	 *10* *15*	 *7* *10*	 *6* *9*	 *3* *6*
4	***Supervising Civil Engg works with respect to Quality, Progress rate, Material, Processes(20)*** *(i) Supervising Quality in work, material etc* *(ii) Supervising Progress of work, precautions etc*	 *10* *10*	 *10* *10*	 *7* *7*	 *6* *6*	 *3* *3*
5	***Developing interpersonal relation (Spoken & written communication)(15)*** *(i) Teamwork and collaboration.* *(ii)Communication skills*	 *10* *5*	 *10* *5*	 *7* *3*	 *6* *2*	 *3* *1*
6	***Drafting skills (15)*** *(i) Presentation skills.* *(ii) Reporting skills*	 *10* *5*	 *10* *5*	 *7* *3*	 *6* *2*	 *3* *1*

- Mistakes are with reference to Technique, Procedure & precautions, while precision refers to technique, procedure, precautions, time & result

(Marks awarded in words: .....)

Signature of the Training In-charge (Mentor)
Name
Designation

Signature of the faculty incharge (Guide)
Name
Designation